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Journal of Biomedical Research & Environmental Sciences main aim is to enhance the importance of science and technology to the scientific community and also to provide an equal opportunity to seek and share ideas to all our researchers and scientists without any barriers to develop their career and helping in their development of discovering the world.

CASE REPORT

A Case of Capnocytophaga Canimorsus Meningitis in Immunocompetent Host: A Zoonotic Agent in the Lombardian Alps in Italy

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ABSTRACT

The author reports the case of *C. canimorsus* meningitis consecutive to *Capnocytophaga canimorsus* infection in a 51-year-old man. Human infection is rare but can lead to devastating outcomes. In patients in whom shortly after a dog or cat bite symptoms of meningitis occurred, *C. canimorsus* infection should be considered. The purpose of this report is to raise awareness of *C. canimorsus* among physicians when faced with a patient presenting with meningitis, who has been exposed to dogs or cats. Clinicians should adopt a higher clinical suspicion in the absence of classical risk factors. Although mortality is relatively low, survivors often have neurological sequelae. This case report highlights the importance of thorough history taking to assess risk of underlying *C. canimorsus* infection, even in immunocompetent hosts.

INTRODUCTION

Transmission of pathogens causing bacterial meningitis can also occur from animals to humans, known as zoonotic bacterial meningitis. One of these zoonotic pathogens is *Capnocytophaga canimorsus*. There are 9 species of *Capnocytophaga*, which can be classified into 2 main categories: human-oral associated and zoonosis associated. The species *C. gingivalis*, *C. granulosa*, *C. haemolytica*, *C. leadbetteri*, *C. ochracea*, and *C. sputigena* are a part of human oral microbiota, whereas *C. canimorsus*, *C. canis*, and *C. cynodegmi* are commensal organisms in the mouths of dogs or cats [1]. Human strains are found predominantly in immunocompromised patients in gingival plaque in the periodontal disease [2]. I summarize the microbiology, epidemiology, risk factors, clinical manifestations, diagnostic and treatment of *C. canimorsus* infection. The bacteria, known formerly as “dysgonic fermenter-2” newly named in 1989, is a fastidious gram-negative bacillus, capnophilic rod, a slow-growing, facultative anaerobic, that can cause various clinical syndromes in humans [3]. The bacteria was first described by Bobo and Newton in 1976 after isolation of the bacterium from blood and cerebrospinal fluid of a man who developed septicemia and meningitis after being bitten by the dog [4]. Is part of the normal flora in the mouths of dogs and, less commonly cats [1]. An environment of 5-10% CO₂ and temperature of 37°C constitute the optimal conditions for the bacterial growth and need to be incubated in these conditions for at least 5 days [5]. *C. canimorsus* is catalase positive, and by degrading hydrogen peroxide in phagocytic vacuoles, this enzyme could allow the bacteria to survive within phagocytes. Furthermore, is resistant to killing by serum complement [6,7]. For that reason, it escapes the effects of the human host immune system. The fastidious bacteria

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requires extended incubation times, leading to delays in detection and appropriate treatment [8]. Incidence rates of positive identification of *C. canimorsus* in animals depend on the diagnostic technique used and vary widely. Previously conducted surveys of *C. canimorsus* prevalence in the oral cavities of dogs and cats have revealed vastly different results among studies. In 1989, Westwell, et al. [9] published results of their research in which swabs from oral cavity of 180 dogs and 249 cats were obtained. *C. canimorsus* (DF-2) was detected in oral flora of 24% of the dogs and 17% of the cats. Since it was difficult to grow the microorganism, these authors used a selective medium make the isolation and recognition of DF-2 organisms comparatively easy. Cotton wool tipped swabs of incisor teeth and gingival margins were placed in Amies charcoal based transport medium for delivery to the laboratory, where they were cultured using brainheart infusion agar (Difco) containing horse blood 5%, cysteine hydrochloride 0.5 g/l, kanamycin 25 mg/l, and vancomycin 1 mg/l. Plates were incubated in 95% air and 5% carbon dioxide in 95% relative humidity at 37°C and examined after three and five days. Suzuki, et al. [10] examined samples from oral cavity of 325 dogs and 115 cats using PCR method. In their research, *C. canimorsus* was found in 240 (74%) dogs and 66 (57%) cats. In the study of Umeda, et al. [11], the prevalence rate of *C. canimorsus* was 69.7% in dog and 54.8% in cat when both the PCR and cultivation methods were used, was like that reported earlier for a different area of Japan (74% in dogs, 57% in cats) [10]. Recent reports have shown the prevalence to be up to 74% of dogs [12]. The prognosis of *C. canimorsus* infection is poor in humans, mortality due to severe *C. canimorsus* infections is approximately 30% [13,14]. In immunocompetent people *C. canimorsus* rarely leads to systemic infections. Veterinarians, breeders and pet owners are particularly at risk of *C. canimorsus* infection. The risk factors for infection with *Capnocytophaga canimorsus*, include splenectomy, liver cirrhosis, smoking, and malignancy, immunocompromised condition, history of heavy alcohol use and a history of animal or human bite [15]. Elderly and people over 50 years old are more vulnerable to infection [16]. Regarding infection in humans, *C. canimorsus* infection most commonly are associated with dog or cat bites (54% of cases), scratches (8.5% of cases) or close contact, e.g., animals licking pre-existing wounds (27% of cases), and in about 10% of described cases the source of infection remained unknown [17]. *C. canimorsus* infection has a wide range of clinical symptoms. Clinical manifestations of *C. canimorsus* infection include fever, meningitis, brain abscess, endocarditis, mycotic aneurysm, respiratory tract infection, and orthopedic infections such as septic arthritis [18]. It is of low virulence in healthy people; however, in certain cases, the infection can lead to severe complications and even death [5]. Mortality rate in meningitis caused by *C. canimorsus* is about 5% [19]. The most common cause of death among patients with *C. canimorsus* infection is septic shock, with mortality reaching up to 60% in these cases [5]. One of the tools for diagnosing *C. canimorsus* is microbial cultures. Cultures are performed on 5% sheep blood or chocolate agar media and incubated for at least 5 days in a

temperature of 37°C in environment of 5–10% CO₂. However, the organism shows a slow growth on microbiological media [3]. Therefore, traditional culture of the organism delays diagnosis in such cases [20]. The actual gold standard is 16S rRNA gene amplification followed by sequencing of the PCR product, which is a highly sensitive molecular method and has been widely implemented, also *C. canimorsus* strains can be identified with MALDI-TOF (matrix-assisted laser desorption/ionization time-of-flight analyser) [21]. *Capnocytophaga* spp. are sensitive to penicillins, 3rd generation cephalosporins, carbapenems, clindamycin, doxycycline, and chloramphenicol [5]. Antibiotic prophylaxis after dog or cat bite to prevent the infection is recommended in immunocompromised patients, asplenia, advanced liver disease, edema in the site of the bite, moderate or severe wounds—and Amoxicillin/clavulanic acid is the first-line antibiotic prophylaxis after dog or cat bite, and doxycycline or clindamycin can be considered in the setting of penicillin allergy [15].

CASE PRESENTATION

The author reports the case of an immunocompetent case of *C. canimorsus* meningitis in a 51-year-old Caucasian man. He worked as an employee of a bank and lived with his wife and dog in a family house. On presentation in the emergency department, he complained of fever (38.5°C), headache was referred as unusually severe and stiff or sore neck, general abdominal pain, nausea, retching, and general weakness, with all the symptoms appearing on that same day. By taking his medical history, it was possible to find out that he was bitten by a dog few days prior to admission. On admission, the patient was febrile, blood pressure was 130/90 mmHg and pulse was 80 beats per minute, and Glasgow Coma Scale was 15. Abdominal exam showed no local resistance. The neurological examination showed only a mild stiffness of his neck and without any focal neurologic deficit. In the context of meningismus including neck stiffness and concurrent fever, a meningitic process was suspected. The patient did a brain scan and immediately after an abdomen scan. CT scan of the brain revealed no cerebral lesions, and abdominal CT scan was unremarkable, in particular the spleen appeared within normal limits. Laboratory studies performed at admission, apart from C-reactive protein (CRP) 48mg/L, all biochemical and hematological parameters were within normal limits. A lumbar puncture was performed during the first hour of admission after the TC scan, and Cerebrospinal Fluid (CSF) was turbid, with 410 leukocytes/mL, elevated protein (2390mg/dL) and low glucose (20mg/dL). Both aerobic and anaerobic CSF cultivation in blood culture bottles were ordered, as well as blood. An empiric combination of broad-spectrum antibiotics was given as soon as blood samples and CSF were drawn for microbiological examination. CSF was cloudy, for this reason microscopic examination was performed for pathologic cells or microbes in the blood (Figure 1). A combination therapy of intravenous dexamethasone (4 mg every 12 h), ceftriaxone (2 g every 12h), and ampicillin (3 g every 6h) was

started. Intravenous ampicillin was added to the therapy, but only two doses were administered, because *Listeria spp.* was soon ruled out as the causative agent, and microscopic examination of the cerebrospinal fluid showed unidentified for gram-negative bacilli. Ampicillin was replaced the next day with gentamicin. As there was no growth detected by the CSF and blood cultivation on the second day, the cultivation analysis was continued further to the total length of 9 days. On the 9th day of admission, blood and CSF cultures revealed massive infection with Gram-negative bacteria identified as *C. canimorsus*. *C. canimorsus* was isolated in blood and cerebrospinal fluid, therefore there were no more doubts. The patient recovered steadily during 9 days of antibiotic treatment, and meningismus resolved during her hospital stay. The patient fully recovered and was discharged from the hospital-without sequelae.

Figure 1 Peripheral-blood smear showed the presence of *C. canimorsus*.

CONCLUSION

I report an additional case of *C. canimorsus meningitis* a rare disease in immunocompetent host. However, its presentation in immunocompetent patients should not be overlooked, as timely diagnosis and treatment can be lifesaving in such cases. Clinical suspicion of a *Capnocytophaga spp.* infection is mandatory when establishing the differential diagnosis of a meningitis of unknown origin, especially in cases of a previous contact history with a dog and/or cat. Rapid initiation of appropriate treatment is essential for favorable patient outcomes.

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