Case Report

Streptococcus suis meningitis in a COVID-19 patient: A case report

ABSTRACT

Streptococcus suis is a Gram-positive, facultative anaerobic bacterium and has its natural reservoir in pigs. Infection by this microorganism usually manifests in humans as meningitis, endocarditis, sepsis, and/or arthritis after contact with pigs or pork. Meningitis is a very common manifestation and *Streptococcus suis* may be considered its second most common cause. A clinical course may manifest acutely or with a more chronic course. *Streptococcus suis* is endemic in pork-consuming and pig-rearing countries, but may occur all over the world, especially in individuals with occupational exposure to pigs and/or pork, such as abattoir workers, butchers, and farmers. Most infections are observed in adults without preexisting diseases. We report a case of *Streptococcus suis* meningitis in a healthy patient with occupational exposure and with an asymptomatic infection by severe acute respiratory syndrome coronavirus 2, who was admitted to an intensive care unit in a tertiary hospital in the North of Portugal.

Key words: COVID-19 pandemic, meningitis, *Streptococcus suis*

Introduction

Streptococcus suis is an encapsulated Gram-positive, facultative anaerobic bacterium. This microorganism is endemic in pork-consuming and pig-rearing countries, but *Streptococcus suis* infection may occur all over the world, especially during pork product consumption or via occupational exposure to pigs and/or pork. Infection usually manifests in humans as meningitis, endocarditis, sepsis, and/or arthritis. Although in Portugal, the pathogen has been reported in pigs, there are limited case reports of infection in humans. We report a case of *Streptococcus suis* meningitis in a coronavirus disease 2019 (COVID-19) patient from Porto, North of Portugal. Medical records of the patient were reviewed during his hospitalization in the Intensive Care Unit of Centro Hospitalare Universitário do Porto, a tertiary hospital. The patient approved the publication of his case and provided written informed consent.

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Case History

A 36-year-old male patient, who works as a butcher and has a history of smoking and cannabinoid consumption, presented to the emergency room with a severe headache, fever, dysarthria, confusion, and psychomotor agitation. Physical examination on admission revealed a Glasgow Coma Scale of 13 (O4V4M5), nuchal rigidity, respiratory

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distress, and desaturation. Pulmonary auscultation showed diminished breath sounds bilaterally. Brudzinski's, Kernig's, and Lasegue's signs were absent. The remainder of the examination was unremarkable. Laboratory findings on admission revealed leukocytosis (19,1 × 10^3) with neutrophilia (9,16 × 10^3), elevated C-reactive protein (188 mg/dl), and thrombocytopenia (10,6 × 10^3). Renal and hepatic function, ionogram, and serology tests were unremarkable. Urine toxicology tests were negative.

Based on a suspicion of meningitis, a cerebral computerized tomography was performed and revealed hydrocephalus in the third ventricle without signs of herniation or deviation of midline structures. A cerebrospinal fluid analysis was then performed and showed glucose levels of 1 mg/dL, a protein concentration of 671 mg/dL, a white blood cell count of 104 cells/mm^3 and a cerebrospinal fluid Gram stain with Gram-positive diplococci. Acute bacterial meningitis was diagnosed, and a therapeutic regimen of ceftriaxone, vancomycin, acyclovir, dexamethasone, and thiamine supplementation was started. The patient also tested positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections. He was sedated and mechanically ventilated due to psychomotor agitation and was transferred to the intensive care unit (ICU), with vasopressor support.

Intracranial pressure was monitored, and the patient developed intracranial hypertension with a need for cerebrospinal fluid drainage through a lumbar drain. He also developed seizures, detected on processed electroencephalogram monitoring (bilateral Bispectral Index – BIS™), which showed epileptiform discharges like those seen in conventional electroencephalogram. Anticonvulsant therapy (levetiracetam) was initiated for the control of epileptiform activity. Cerebrospinal fluid culture samples were positive for *Streptococcus suis II*, which was susceptible to penicillin and ceftriaxone. Antibiotic therapy was administered for 14 days, and dexamethasone was discontinued after 5 days. During hospitalization, there was improvement in oxygenation and hemodynamic stability, so sedation was stopped, and the patient was successfully weaned from mechanical ventilation. There was no recurrence of seizures or focal neurological deficits. The patient was discharged to a district hospital, with complete resolution of symptoms.

Discussion

Streptococcus suis is one of the most common zoonotic pathogens causing bacterial meningitis. This infection is endemic in South-East Asia due to high pork consumption and pig rearing. However, cases of *Streptococcus suis* meningitis occur all over the world, especially in people having occupational contact with pigs or pork.[1]

Meningitis occurs in approximately 50–60% of infected patients.[2] In a systematic review and meta-analysis, the classic triad of bacterial meningitis was low (9%) but fever, headache, and neck stiffness were present in a large proportion of patients.[3,4]

Streptococcus suis meningitis has lower mortality when compared to other agents.[5] The main complication is deafness, which may be present on admission, develop during hospitalization and may be irreversible.[5-7] These patients should be evaluated early by an otolaryngologist.

The treatment principles of *Streptococcus suis* meningitis are the same as those for other bacterial meningitis. Most *Streptococcus suis* are sensitive to penicillin or cephalosporins.[5] Dexamethasone has been shown to decrease mortality in pneumococcal meningitis and to decrease hearing loss and neurological sequelae in all bacterial meningitis.[8,9] However, its effect on *Streptococcus suis* meningitis remains controversial.[10]

This case presents the management and treatment of a patient with *Streptococcus suis* meningitis, infected with SARS-CoV-2. The patient was initially evaluated for a possible sepsis, without a clear focus of infection. Due to neurological symptoms and consciousness state deterioration, a cerebral computerized tomography scan was performed with evidence of hydrocephalus of the third ventricle, followed by the need of sedation and intubation and transfer to the ICU, due to worsening of the neurological status. Therefore, meningitis was assumed, and broad-spectrum antibiotic therapy was started.

According to the hospital protocol at that time, a polymerase chain reaction search for SARS-CoV-2 infection was performed as an admission screening. The test was positive, however, the patient never had symptoms or alterations in other diagnostic exams that suggested COVID-19 disease. The patient was admitted to a COVID-19 ICU due to a need for isolation.

Streptococcus suis meningitis is the most common manifestation of infection by this agent. Little is known about how *Streptococcus suis* invades the host and how it crosses the blood-brain barrier, but sepsis is known to be the second-most common manifestation and a major cause of *Streptococcus suis* related death. The patient had no other risk factors, such as asplenia, diabetes mellitus, alcoholism, malignancy, or structural heart disease.[9]

Given the positivity of cerebrospinal fluid culture for *Streptococcus suis* and the risk factor of working as a butcher, without adequate work protection, and having frequent contact with the nasal and oral cavity, this was assumed to be the source of contamination and infection. The patient had a good response to ceftriaxone and vancomycin, with resolution of symptoms. As previously mentioned, early hearing impairment and vestibular dysfunction are characteristic features in patients with *Streptococcus suis* meningitis. In our case, the patient did not present any hearing loss.

This case describes the management and treatment of *Streptococcus suis* meningitis in a COVID-19 patient with occupational exposure. Although in Portugal, the pathogen has been reported in pigs, there are limited case reports of infection in humans. In addition, this case happened during the COVID-19 pandemic.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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