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(CASE REPORT)

Mixed *Streptococcus pneumoniae* and herpes simplex virus meningoencephalitis confirmed by PCR: A case report and review of the literature

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Abstract

This case report describes a rare and severe instance of meningoencephalitis caused by a dual infection with *Streptococcus Pneumoniae* (pneumococcus) and *Herpes Simplex Virus* type 1 (HSV-1). The patient, a previously healthy 53-year-old woman, was admitted with symptoms of fever, intense headache, neck stiffness, photophobia, vomiting, otalgia, and altered consciousness progressing to seizures. Lumbar puncture revealed a turbid cerebrospinal fluid (CSF) with lymphocytic pleocytosis, low glucose, and high protein. Gram staining showed Gram-positive cocci, and multiplex PCR identified both *S. pneumoniae* and HSV-1.

Despite early treatment with ceftriaxone, acyclovir, corticosteroids, and supportive care, the patient's condition deteriorated, with neurological decline and respiratory distress necessitating intensive care. Imaging showed bilateral pulmonary consolidation but no focal brain lesions. Follow-up CSF analysis showed improvement, though her clinical condition required ongoing critical support.

This case highlights the diagnostic and therapeutic challenges of co-infections in the central nervous system. Dual bacterial-viral meningoencephalitis is rare but associated with high morbidity and mortality. Early and accurate diagnosis via multiplex PCR and a multidisciplinary management approach, including antimicrobial and antiviral therapy along with intensive supportive care, are critical to improving outcomes. Long-term neurological monitoring is recommended due to the risk of lasting complications.

Keywords: Meningoencephalitis; PCR; Pneumococcus; HSV

1. Introduction

Meningoencephalitis is a serious condition resulting from inflammation of the meningeal membranes and brain parenchyma. When caused by dual pathogen infections, this condition becomes even more complex to manage. We report here the case of a patient admitted to the Infectious Diseases Department with meningoencephalitis caused by two germs: *Streptococcus Pneumoniae* (pneumococcus) and *Herpes Simplex Virus* type 1 (HSV-1). This association was confirmed by multiplex PCR in the cerebrospinal fluid (CSF), and the patient presented a rapid deterioration in her clinical condition, marked by consciousness disorders and respiratory distress, requiring transfer to intensive care.

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2. Clinical case

A 53-year-old woman, N. N., with no previous medical history of note, was admitted to the infectious diseases department on suspicion of meningitis. Her symptoms included persistent fever, intense headache, photophobia, vomiting, stiff neck and earache, aggravated by confusion and convulsions. All of this had been evolving for a week .

Clinical examination on admission revealed a febrile patient at 38.5°, tachycardic, polypneic, oxygen saturation in free air 90%, Glasgow Coma Scale (GCS) score 13/15, meningeal stiffness, positive Kerning sign, positive Brudzinski sign, muscle strength of the right upper limb 2/5 and right lower limb 3/5, presence of labial lesions.

A lumbar puncture was performed, showing cloudy cerebrospinal fluid (CSF) with predominantly lymphocytic hypercellularity (290 cells/mm^3), hypoglycorrhachia (0.05 g/L), and hyperproteinorrhachia (12 g/L). Gram staining revealed Gram-positive cocci, and multiplex PCR on the CSF identified *Streptococcus Pneumoniae* and *Herpes Simplex Virus* type 1 (HSV-1). CT brain imaging showed no focal abnormalities, and chest CT showed bilateral posterobasal pulmonary parenchymal condensation foci, with a right pleural fluid effusion. HIV serology was negative and the CBC showed HB:13.5, WBC:12800 with PNN, PLQ: 271000, fibrinogen: 7.3, CRP: 29, ESR: 113, creatinine: 7.6, urea: 0.6, kalaemia: 3.6, natraemia: 168, AST:119, ALT:126, glycaemia: 1.5 .

The patient was treated with ceftriaxone (3g twice daily), acyclovir (10mg/kg every 8 hours), intrathecal corticosteroids.

Control lumbar puncture showed clear CSF, with cellularity of less than 3 cells/mm^3, hypoglycorrhachia (0.15 g/L), and hyperproteinorrhachia (1.4 g/L), sterile culture, and normalization of hepatic cytolysis and blood ionogram.

After 10 days in hospital, she was transferred to the intensive care unit, due to neurological worsening and respiratory distress.

3. Discussion

Meningoencephalitis is a serious condition, often associated with high morbidity and mortality, particularly when caused by multiple pathogens. The case presented here, a meningoencephalitis with dual infection by *Streptococcus Pneumoniae* (pneumococcus) and *Herpes Simplex Virus* (HSV), confirmed by multiplex PCR in the cerebrospinal fluid (CSF), illustrates the complexity of managing these multifactorial infections. This clinical situation is rare but potentially catastrophic, requiring a rapid, multidisciplinary approach to diagnosis and treatment.

The coexistence of bacterial and viral infection in the central nervous system (CNS) is rare but possible, particularly in immunocompromised patients or those with specific risk factors. Combined pneumococcal and HSV meningoencephalitis is relatively rare, but has been reported in the literature [1,2], and represents a major diagnostic and therapeutic challenge.

Pneumococcus can cause purulent meningitis, particularly in young children and older adults, with a classic picture of fever, headache and nuchal rigidity, accompanied by focal neurological signs in severe forms [3]. At the same time, HSV-1, a neurotropic virus, can be responsible for herpetic encephalitis, a condition that leads to consciousness disorders and progressive neurological deficits.[4]

In this case, multiplex PCR enabled simultaneous identification of *S. pneumoniae* and HSV in CSF, underlining the importance of molecular techniques in the rapid and accurate diagnosis of CNS infections [5]. Multiplex PCR has become an essential tool for reducing the time to diagnosis and rapidly initiating appropriate treatment [6,7].

The disorders of consciousness observed in this patient are common in severe meningoencephalitis, whether bacterial or viral in origin [8]. These disorders may result from cerebral oedema, direct inflammation of the cerebral parenchyma or the effect of bacterial toxins [9]. Respiratory distress may be secondary to brain stem involvement, pneumococcal-associated pneumonia or systemic decompensation due to sepsis.[10]

Transfer to intensive care was essential in this setting, given the severity of the clinical condition .

Initial empirical antibiotic treatment for bacterial meningitis includes third-generation cephalosporins and vancomycin, with the aim of covering pneumococcus and other resistant pathogens [11]. For HSV, antiviral treatment with acyclovir

or valacyclovir is recommended for severe forms of herpetic encephalitis [4]. The use of adjuvant corticosteroids in bacterial meningitis remains controversial, but may be considered in some cases to reduce brain inflammation [9].

In our patient's case, combined antibiotic and antiviral treatment was started as soon as co-infection was suspected. Respiratory support and intensive care were essential to stabilize her condition. Resuscitation management mechanisms included mechanical ventilation, neurocognitive monitoring and management of infection-related complications .

The prognosis of dual-infection meningoencephalitis is generally guarded, due to the severity of brain damage and systemic complications. Cases of co-infection with bacterial and viral agents generally have a poorer prognosis, with a high risk of long-term neurological sequelae [2]. Long-term neurological follow-up is essential to assess potential sequelae, such as cognitive deficits, motor disorders or epilepsy [12]. The respiratory complications observed in our patient, together with persistent consciousness disorders, suggest a difficult prognosis. However, prompt and appropriate management remains essential to improve the chances of recovery.

4. Conclusion

This case illustrates the diagnostic and therapeutic complexity of meningoencephalitis caused by co-infection with *Streptococcus Pneumoniae* and HSV. It also highlights the importance of multiplex PCR for rapid and accurate diagnosis. Appropriate multidisciplinary management in the intensive care unit, combining antibiotics and antivirals, and close monitoring of neurological and systemic complications, is crucial to improving patient prognosis.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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