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Case Report

Pneumococcal meningitis by an unusual serotype: a case report

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ABSTRACT

With the evolution of the vaccination and antimicrobian pressure, there has been changes in the *Streptococcus pneumoniae* serotypes becoming more frequent the ones not included in the vaccines. Herein this report presents a clinical case of a 11-month-old boy with meningitis due to *Streptococcus pneumoniae* serotype 24F. This serotype is not included in the vaccines available in Portugal. Therefore, we present this clinical case to explore and understand the changes of bacterial epidemiology.

Keywords: Pneumococcal meningitis, Epidemiology, Eerotype, Vaccines

INTRODUCTION

Worldwide, in 2019, there were approximately 2.51 million new meningitis cases across all age groups, with about 1.28 million occurring in children under the age of 5.[1] In 2019, there were an estimated 236,000 meningitis-related deaths worldwide, with 112,000 among children under 5. However, between 1990 and 2019, the global meningitis mortality rate decreased from 7.5 to 3.3 per 100,000, a 56% reduction.[2]

90-95% of the meningitis are caused by viruses. Enterovirus is the most common one, being responsible for 85% of the viral meningitis.[3]

Streptococcus pneumoniae, *Haemophilus influenzae and Neisseria meningitidis* are the major causes of bacterial meningitis in children <5 years of age worldwide, particularly in countries with limited resources.[4] Pneumococcal meningitis is the most common cause of bacterial meningitis in children over 1 month old, accounting for approximately 70% of cases globally.

The epidemiology of pneumococcal meningitis has changed significantly with the development of new and effective vaccines in the last 2 decades. In high to middle-income countries, the incidence has dropped from 0.8 to 0.1–0.3 per 100,000.[5]

The PSERENADE project assessed PCV10 (serotypes included 1, 4, 5, 6B, 7F, 9V, 14, 18C, 19F, 23F) and PCV13 (serotypes included 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, 23F) impact on pneumococcal meningitis incidence globally and concluded that pneumococcal meningitis incidence declined 48–74% relative to pre-PCV among children aged <5 years, 35–62% among children 5–17 years and 0–36% among adults 18 years and older.[6] A recent systematic review assessed global S. pneumoniae serotype distribution.[7] Despite the availability of PCV, among the 21 studies included in the systematic review, serotypes included in PCV accounted for >60% of the total serotypes in 11 reports.[7] Serotype 19A was the most commonly identified in all of the geographic regions included in this review. In addition, serotypes 1 and 14 were prominent in Europe and Latin America and serotypes 6B, 14 and 19F were important in Africa-East Mediterranean, demonstrating geographic variations in the prevalence of PCV serotypes.[7] Despite the decline in prevalence of PCV serotypes after PCV implementation, they still circulate and remain a significant source of burden, especially in Europe and Latin America.[7]

Although PCVs are included in the national immunization programs in many countries, an effect may only be observed over a long period of time if higher vaccination coverages are obtained worldwide.[7]

In Portugal, the 13-valent pneumococcal conjugate vaccine (PCV13) was available for private use from 2010 to 2015 and it was introduced in the National Immunization Program in 2015.[8] More recently, in 2025, PCV20 was included in the Portuguese National Immunization Program. PCV13 confers protection to the 13 most prevalent pneumococcal serotypes.[8] Additionally, PCV20 also protects 7 more serotypes (8, 10A, 11A, 12F, 15B, 22F, 33F).

CASE REPORT

We present the case of a 11 months-old infant boy with no relevant clinical history, with vaccination up to date according to the Portuguese national vaccination program, with 2 doses of PCV 13 and including vaccines extra-program such as 2 doses of anti-MenACWY vaccine and 3 doses of vaccine against rotavirus.

He presented to the emergency room with a vacant look, paleness and upper members in flexion.

He had a patent airway, without signs of difficult breathing (SpO_2 97%), but was tachycardic (CF 158 bpm) with palpable central and peripheral pulses, paleness, CRT <1 second. He responded to the stimuli, but was drowsy with vacant look, right eyelid ptosis and isochoric and isoreactive pupils. Also, upper limb flexion and neck stiffness were present. Normal blood sugar detected (101 mg/dl). No rashes or petechiae were present but the patient was febrile (axillary temperature of 37,8ºC).

The fever had started only 12 hours ago, with fever spikes every 4 hours and maximum axillary temperature of 39.2 ºC. The infant was drowsy even in apyrexia and with food refusal. No respiratory, gastrointestinal or genitourinary symptoms were reported. The parents had a recent upper respiratory tract infection and the infant had gastroenteritis 2 weeks before. No relevant personal history was mentioned, with no known allergies and with no regular medication.

The patient started intravenous fluid therapy and blood samples showed the following: leukocytosis of 43000/l with 37900/l neutrophils, glucose 114 mg/dl, CRP 18.81 mg/dl and PCT 9.3 ng/ml. Hemoculture and uroculture were collected. Contrast enhanced computed tomography (CE-CT) before lumbar puncture was conducted due to alterations in the neurologic exam, but no abnormalities were found. Lumbar puncture was executed without any complications. Cerebrospinal fluid was turve with 1310 cells (710 leukocytes), glucose 38 mg/dl (<50% seric glucose) and proteins 181.8 mg/dl.

Polymeric chain reaction of multiple viruses such as Herpes, Enterovirus, echovirus, CMV and EBV were all negative. Bacteriological culture of the cerebrospinal fluid revealed a *Streptococcus pneumoniae* serotype 24F.

DISCUSSION

Although less frequent, pneumococcal meningitis continues to be a major health issue in children in our environment.

Candeias et al studied the evolution of the *S. pneumoniae* in Portugal after the introduction of the PCV 13.[9-11] The most prevalent PCV13 serotypes were 19F (4.7% of all pneumococci), followed by serotypes 3 and 19A (1.8% each). Compared to previous periods, the prevalence of these three serotypes showed a statistically significant decreasing trend which was more pronounced between the pre-PCV13 and late-PCV13 periods. Non-vaccinated children and children aged 4–6 years were more likely to carry PCV13 serotypes.

The other PCV13 serotypes remained at a very low prevalence or were not even detected. Non-PCV13 serotypes corresponded to 89.3% after the introduction of the PCV13. The most frequent non-PCV13 serotypes were 15B/C (15.7%), 11A (11.2%), 23B (9.9%) and 23A (7.7%). Serotypes 22F and 33F included in PCV15 and PCV20, but not in PCV13, accounted for 3.6% of the isolates. Serotypes 8, 10A, 11A, 12F and 15B/C included in PCV20, but not in PCV13 nor in PCV15, accounted for 30.5% of the isolates. 55.2% of the serotypes detected in the period after introduction of PCV13 are not targeted by any of the PCVs that have recently become commercially available. They also studied the macrolide resistance that progressively increased mostly due to serotypes 15B/C, 24F, 19F and 33F. These findings suggest that the pneumococcal population is evolving and adapting to the pressure caused by the PCV13 vaccine and the antimicrobial use.

Similar results are discussed by Zamalloa et al that showed a significant reduction in the incidence of pneumococcal invasive disease caused by the serotypes included in the PCV13 in all age groups, in Madrid.[12,13] However, the incidence of serotypes not included in conjugate vaccines has continuously increased, especially in those under 5 years of age.

In Lebanon, Reslan et al studied the emergency of S. pneumoniae serotype 24F, the same one detected in our patient.[14] Overall, serotype 24F corresponded to 1.36% of all surveillance isolates, mainly in children less than 6 years of age. Studied isolates, collected from different regions in Lebanon, revealed similar antimicrobial resistance profiles and genetically homogenous patterns.

In Portugal, none of the available vaccines protects against the serotype identified in our patient.

CONCLUSION

The aim of this case is to draw attention on the still present pneumococcal meningitis in a highly immunized population of children that can have a fulminant outcome, particularly with aggressive serotypes not covered by the vaccines and with antimicrobial resistance. Understanding the serotype epidemiology of invasive pneumococcal disease among children is necessary for vaccine development and introduction policies.

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