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# *Streptococcus pneumoniae* as an Unusual Aetiology of Meningitis Sepsis in a 72 Hours Newborn: A Case Report

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## Abstract

We report a case of pneumococcal neonatal meningitis in an Italian girl, occurred 3 days after birth. CSF microscopic examination revealed the presence of Gram Positive diplococci, identified as *S. pneumoniae* after detection of pneumococcal capsular antigen. Tests for Group B Streptococcus on mother and child were both negative. The case was peculiar because in industrialized countries the most common agents responsible of neonatal meningitis are GBS, *E. coli* and *Listeria monocytogenes*, where pneumococcal meningitis in the neonatal period is quite uncommon. It is then necessary to consider that, in any case of early onset neonatal meningitis *S. pneumoniae* is a possible yet uncommon causative agent, and that the microbiological profile of early onset neonatal meningitis in industrialized countries might change substantially because of migratory streams and the subsequent diffusion of emerging microorganisms, which are unusual at the present time.

**Keywords:** Pneumoniae; *E. coli*; Meningitis Neonatal

## Introduction

We talk of neonatal meningitis when a microorganism is isolated in CSF during the first month of extra uterine life. Clinically, this infection usually presents as a septic condition associated to neurological signs such as irritability, seizures, muscle hyper tone, vomiting, sharp cry, hyperpyrexia and pulsing anterior fontanelle. In pediatric population mortality rates vary from 20% to 40% with a 20% risk of CNS sequelae and permanent acoustic dysfunctions particularly related to pneumococcal infection [1]. The most frequent cause of neonatal meningitis is Group B *Streptococcus* (GBS), with

vertical transmission. Pneumococcal infection can be transmitted through contact with infected subjects or asymptomatic carriers, while vertical transmission is a rare yet possible occurrence. The incubation period may vary from 1 to 3 days. This case report is aimed to be an addition to the existing literature regarding cases of neonatal meningitis considered that in industrialized countries this infection still is, along with sepsis and pneumonia, the first cause of death of the newborn in the first 60 days of life, advancements in antibiotic therapy notwithstanding [2].

## Case Description

The patient was given birth at 41 weeks and 2 days, after labor was induced because of oligohydramnios; no other complication occurred during pregnancy and maternal serologic tests for Group B *Streptococcus* were negative. At birth, the patient showed good adaptation to extra uterine life (APGAR 10/10 at 1 and 5 minutes) and both anthropometric measurements and weight were within normal range. At day 3 after birth, because of the onset of hyperpyrexia, trunk and limb rigidity and sunsetting eyes, blood tests were carried out, showing an increase in inflammatory markers (PCR 10.9 mg/dl). At the same time blood culture was found positive for *S. Aureus* and *S. Warneri*, while urine culture was found positive for Serratia Marcescens (>100.000 CFU/ml), for this reason empirical antibiotic therapy with intravenous Ampicillin and Metilmicin was initiated. The patient was then transferred to neonatal ICU after her clinical condition worsened, with hyporeactivity, axial hypotonia, limb hypertonia, absence of the reflex of Moro, shrill cry, pallor and mild jaundice. A lumbar puncture was then performed because of the suspicion of CNS involvement: the turbid appearance of the CSF sample suggested continuous antibiotic therapy with Ampicillin, Sulbactam and Amikacine. CSF laboratory examination showed an elevated protein concentration and WBC count, while microscopic examination revealed the presence of Gram

positiv diplococci, further confirme when PCR detected the presence of *S. pneumoniae* capsular antigen no viral DNA was found. Blood tests showed an elevated WBC count (13210 mm<sup>3</sup>) and a further raise in PCR (177mg/dl); the subsequent blood culture was positiv for Meticillin resistant strains of *S. Aureus* and *S. Epidermidis*, which forced to replace Amikacine with Vancomicine. Such therapy was continue unti day 14.

In order to further investigat the patient' neurological condition diagnosti imaging procedures were carried out: serial brain echography evidenced a marked oedema without signs of activ hemorrhagic foci. Hemi cranial electroencephalography detected nonspecificall anomalies in the front cerebral regions and subsequent MRI showed no signs of hemorrhagic, ischemic or expansive lesions. Serum levels of immunoglobulins and complement factors were then investigate because an immunodeficienc conditio was suspected, but no abnormalitie were found. Other blood tests were carried out during the following period of hospitalization showing a progressive decrease in both inflammator and infectio markers, unti their complete normalizatio at day 26, afte which the patien was discharged with a fina diagnosis of *S. pneumoniae* meningitis. At discharge, physical examinatio showed no abnormalities the patien fed well with both maternal and artifici milk, with a weight gain of 850 g. Neurologic and auditory follow up exams were then programmed.

## Discussion

The causativ agents of neonatal bacterial meningiti are differen geographically. In most developed countries the main causativ agents for neonatal bacterial meningiti isolated from cerebrospinal flui (CSF) are Group B Streptococcus (GBS), *E. coli*, *Listeria monocytogenes* and at least *S. pneumoniae*. The Reasons for this may include geneti difference in immune response and possibly geographic difference in laboratory techniques for pathogen isolatio and reportin and they are also influence by maternal and infant risk factors, preventio and treatment strategies of the country [3]. Pneumococcal meningiti in the neonatal period is uncommon (only 28 cases reported in literature before 1945), however it's related to high mortality and morbidity rates, in particula neurological sequelae are a frequent occurrence. Neonatal and maternal risk factors for developing neonatal meningiti include low birth weight, prematurity, premature ruptures of membranes, maternal chorioamnioniti and low socioeconomic status. The newborn is particularl susceptibl to infectio as the immature immune system is deficien in humoral and cellular immune responses: for this reason the patient' immune state has been assessed, but test finding were normal. On the other hand, the importance of maternal infectio was already highlighted by Berman and Banner in 1922, when they observed in their study that, in more than half of mothers with affecte newborns, the same microorganism was isolated. The evidence that obstetrical complication increase the risk of infection and that infectio occurs within six days afte birth, suggests that it is transmitt during childbirth, through placenta or birth canal [4]. However,

*S. pneumoniae* is not usually part of the vaginal flora and it is present only in 0.03% to 0.75% of pregnant women [5]. Meningitis as in the case here discussed, is accompanied by sepsis in 25% of cases, not necessarily caused by the same microorganism. This result in increased morbidity and mortality rates [6]. These elements lead to the following observations if meningiti is suspected, it is necessary to initiat an aggressive empirical antibio treatment, which must extend to all the pathogen agents potentiall involved: the combinatio of ampicillin with an aminoglycoside, or a third generatio cephalosporin, is effectiv. However, it is necessary to consider that also *S. pneumoniae* is a possible etiologica agent, which responds well to the administratio of Vancomicine, and that such treatment must be initiate when microscopic confirmati is available: the findin of Gram positiv diplococci in the blood smear is sufficien as suggested by Yagmur Bas [6]. Moreover, considered that *S. pneumoniae* is an uncommon agent in neonatal meningitis it is advisable to investigat the state of cellular immune response of the affecte newborn, in order to rule out any immunodeficienc condition.

## Conclusion

A large scale world health organizatio (WHO) study conducted in various countries of meningiti belt has documented that *S. pneumoniae* being the most common organism. This lead us to the hypothesis that, in the next years, the microbiological profil of early-onset neonatal meningiti in industrialized countries will change substantiall because of migratory streams and the subsequent diffusio of emerging microorganisms, which are unusual at the present time. Perhaps, new infectiv screening panels will be necessary during pregnancy, in order to carry out a highly effecti antibio prophylaxis, rationall based on laboratory findings. In Spain, there are 16 published cases of neonatal pneumococcal disease: 14 with early-onset and 2 with late-onset.6 The administratio of heptavalent pneumococcal vaccines over recent years, and most recently the 10- and 13-valent types (including the 7F, 3, and 6A serotypes, which are an important cause of invasive pneumococcal disease worldwide), has reduced the transmission of diseases due to pneumococcus in the general populatio (from 50-100 to 9 cases for every 100000 people) and, consequently, the incidence of neonatal invasive pneumococcal disease has decreased. Vaccinatio during the third trimester of gestatio could be a measure to follow in the future, although there are no conclusive studies that currently confir this. Cases such as the one here described demonstrate how molecular research, through the actuatio of new diagnosti methods, is nowadays vital to reach an etiologica diagnosis, in particula for those infection requiring prompt treatment in order to decrease morbidity and mortality rates. This case report allows highlightin that in medicine, paradigms are subject to continuou evolutio and changes, which force clinicians to adopt new diagnosti and therapeuti strategies, especially in infectiou field where statisti show a constant evolutio of etiologica profile of the main diseases which need, in the

neonatal period, prompt treatment with the appropriate instruments.

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