

Pneumococcal meningoenkefalitis in a 50-days-old baby with lethal outcome – case report

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Abstract

S. pneumoniae is one of the leading causes of bacterial meningitis. In children under 2-year-old it appears as the second bacterial agent who is responsible for neuroinfections. Pneumococcal meningitis is an important clinical condition which progresses rapidly and can result in death or significant morbidity if it is not treated as a medical emergency.

Aim: The purpose of this study is to describe a case of *S. pneumoniae* meningoenkefalitis as a primary localization in a 50-day-old breast fed child and to discuss the possibilities to escape such illness in this young age.

Methodology: Clinical, epidemiological, laboratorial, microbiological and instrumental investigations were completed.

Findings: The illness began with high temperature and mild catarrh. Three days later convulsions without meningeal signs were demonstrated. Diagnosis was based on cerebral fluid changes and microbiological verification. In spite of triple antibacterial starting suitable to microbial sensitivity neuroinfection completed with lethal outcome. Laboratorial data – low levels of natrium, severe acidosis in conjunction with high level of protein, cells and low glucosis were considered as prognostic signs for unfavourable outcome. The baby had not been vaccinated with Sinflorix because his insufficient age.

Conclusion: Using vaccine against *S. pneumoniae* for adults is the right solution for prevention pneumococcal diseases at babies at very young under-vaccinating age.

Abbreviations

IPD: Invasive pneumococcal disease; GCS: Glasgow coma scale; CSF: Cerebro spinal fluid; ESR: Erythrocyte sedimentation rate; CRP: C reactive protein; CT: Computer tomography

Introduction

Streptococcus pneumoniae is a major cause of infectious disease worldwide. It is a Gram+ bacterium, which may colonize nasopharynx of healthy carriers without any symptoms. Distribution of all 94 serotypes of *S. pneumoniae* depends on age, season and geographic area [1,2].

Nasopharyngeal colonization usually acquired around 6 months of age but can occur as early as the first week of life. Although the average length of carriage is 3 to 4 months young infants may harbor *S. pneumoniae* for over a year [3]. *S. pneumoniae* affects predominantly respiratory tract, sinuses, nasal and oral cavity but in immunocompromised patients it may engaged other loci [4]. *S. pneumoniae* is an usual agent of pneumonia in society, meningitis in the small age and adults, septicemia in HIV+. Its clinical spectrum involves also rhinitis, conjunctivitis, sinusitis, bronchitis, medial otitis, osteomyelitis, septic arthritis, endo- and pericarditis, peritonitis, cellulitis and brain abscess [5]. Invasive pneumococcal disease (IPD) is defined as infection of any normal sterile site [6]. IPD continues to be a major cause of morbidity and mortality worldwide especially in children under 5 years of age [7,8]. The age group under 2 years of age is particularly susceptible to infections partly as the result of an immature immune response and frequent to and colonization by *S. pneumoniae*.

Distribution of *S. pneumoniae* in the young age is as follows: from 3 to 5 months - more often are meningitis, from 6 to 12 months – medial otitis, and from 13 to 18 months – pneumonia [9]. During the first 2 to 3 months full-term infants have some protection against pneumococcal infections through the passive transfer of maternal antibodies [10]. Infecting is carried out through direct contact by drops, splashes and secrets during the speech, cough and cold [11]. *S. pneumoniae* is one of the leading causes of bacterial meningitis [12]. Pneumococcal meningitis is an important clinical condition which progresses rapidly and can result in death or significant morbidity if it is not treated as a medical emergency. Prompt diagnosis and early management with antibiotics and supportive treatment are vital to reduce mortality and subsequent complications. But...Despite early diagnosis appropriate antibiotic therapy and intensive medical care significant levels of morbidity and mortality continue to be associated with invasive pneumococcal disease [13]. It is known that in the age under 2 years the common agents of meningitis are Gram-negative bacteria - about 80%. In the rest 20% leading position has *S. pneumoniae*. In the age between 2-6 months 73% of neuroinfections are caused by *S. pneumoniae*. In children especially it caused between 1 to 2 million deaths worldwide every year [14].

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Case report

S. S. S. was a suckling boy who is conceived by “*in vitro*”, born by Cesarean section after 9-years sterility. His birth weight was 4050 g. On the 5-th minute his APGAR was 5. Mechanical ventilation and oxygenation were administered.

Up to his 50-th day of life obligatory vaccines according to Bulgarian immunization calendar had been applied. On Sept. 22, 2016 boy was restless and irritable with temperature up to 39.1°C. His appetite was not been reduced. He had been examined by pediatrician and symptomatic therapy was recommended. Two days after he vomited several times and had unstable feces twice. At the day of hospitalization he was languid and refused food. Two weeks before his parents had mild catarrh and malaise. On admission at the Clinic of Infectious diseases of the University hospital on Sept.25, 2016 he looked disturbed and intoxicated with temperature 37.8°C. His skin was pale, there were sore throat and furred tongue. There were not enlarged lymph nodes. His somatic status was normal. Large fontanelis is 10 × 10 mm without prominence. Except exaggerated tendon reflexes there were no neurological meningeal signs. Two hours after admission the patient demonstrated four consecutive generalized convulsions and became soporous, GCS=6-7. CT of brain showed no signs of cerebral edema. Lumbar puncture appeared to be the single most important diagnostic study. Cerebrospinal fluid (CSF) showed low level of glucose, high cell count and high level of protein Table 1. *S. pneumoniae* was identified by Gram staining microscopy of the cerebrospinal fluid as well as culture of CSF. The isolate was identified by standard procedures including both tests for bile solubility and optochin sensitivity. Pneumococcal isolate was serotyped by Neufeld Quellung reaction with type and factor specific antisera. Serotype 6B was identified.

On the second day the respiration disorders called for pulmonary ventilation. The status worsened –cerebral coma. In spite of oxygen supply changes in blood-gas analysis showed deepening metabolic acidosis with high level of partial pressure of carbon dioxide up to 81,7 kPa. The level of sodium was lower than normal – it warried between 124-133 mmol/l. At the same time the level of potassium was from normal to high – 4,9 – 8,1 mmol/l.

Inflamatory indexes showed ESR 90 mm, CRP up to 306,3 mg/l and fibrinogen’s level up to 6,47 g/l. Laboratorial investigations of complete blood count correlated with the burden of disease. Leucopenia at the beginning was 3,1.10⁹/l but rapidly raised up to 25,1.10⁹/l with neutrophilia. A week after the admittance there was anaemia 92-81 g/l. Low level of platelets was mentioned two days before the death. The level of aminotransferases was normal all the time.

The antibiotic susceptibilities of the identified *S. pneumoniae* were

determined by the Bauer-Kirby Disk Diffusion test. The isolate was sensitive to all of tested antibiotics. The antibiogramme was as followed in Table 2.

Ethiological therapy was built on the antibiogram. For the first two days it was a combination of Medaxon 2 x 500 mg i.v + Amikacin 2 x 40 mg. i.v., After that it was changed by Meronem 3 x 200 mg i.v., + Penicillin 4 x 1250000 E i.v. + Amikacin 2 x 40 mg i.v.

Pathogenetical treatment against cerebral edema consisted of Sol. Mannitholi 10% 4 x 30 ml i.v., Dexamethasone 3 x 1 mg i.v., and bioproducts as fresh frozen plasma and humman albumin. Immunovenin-intact x 5 ml i.v. for the first 3 days and Dopamine were applied.

Discussion

S. pneumoniae affects mainly children under one year of age, especially new-born infants [15]. Meningitis in infants often were shown by unspecific symptoms. These could include low-grade fever, irritability and loss of appetite as well as vomiting and diarrhea. We observed most of these in S.S.S. The disease was beginning acutely with high temperature, but appetite was not affected. It seemed as if the symptoms more often looked like some kind of viral intestinal infection. The early signs of meningitis can resemble the symptoms of influenza. For infants, clinical signs consisted of: constant crying, excessive sleepiness and irritability, inactivity, poor feeding, high fever, stiffness in the baby’s body or neck, seizures, or a bulging fontanelle [16]. Surprisingly there was not bulging fontanelle at the admittance as it was shown by CT of the brain. Approximately 15% of patients have focal neurologic signs upon diagnosis. A stiff neck may not be present in young children, it was typically of missing. The presence of focal neurologic signs predicts a complicated hospital course and significant long-term sequelae [17]. We didn’t observed classical neurological signs of meningeal syndrome except some strengthened tendon reflexes. Four consecutive generalized convulsions in S.S.S. with respiratory difficulties marked change for the worse – cerebral coma. According to the Nigrovic LE *et al.* generalized or focal seizures are observed in as many as 33% of patients. Their duration and tough response predicted complicated hospital course with serious sequelae [17] Clinical presentation, laboratorial findings and epidemiological analysis confirmed the diagnosis *S. pneumoniae* meningoenfalitis. *S. pneumoniae* was identified microbiologically with combination of CSF pleocytosis, elevated CSF protein and low level of CSF glucosis. CSF/serum glucose ratio was under 0, 02.

Identified in our case serotype 6B of *S. pneumoniae* is one of significantly more common serotypes in children [18]. The serotypes commonly defined as “PEDIATRIC SEROTYPES” are: 6B, 9V, 14, 18C, 19F, 23F, while among adults serotypes 3 and 4 were predominant [19].

Table 1. Laboratorial changes in CSF.

Data/ Indicators	25.09.16	26.09.16	30.09.16	03.10.16
Leuc	162	1813	3754	108
Er	27	480	512	22
Protein	3,03	1,65	1,153	1,73
Glucose	0,9	0,01	1,75	4,1
K	3,2	2,9	3,4	4,3
Na	139	131	137	135
Chl	104	111	104	110
Pandy	+	+	++	++
Sediment- % Polymorphonuclears	75%	78%	87%	7%

Table 2. Antibigram of isolated *S. pneumoniae*.

Antibiotic	Sensitivity
Penicillin	+
Oxacillin	+
Ceftriaxone	+
Cefotaxime	+
Meropenem	+
Teicoplanin	+
Vancomycin	+
Clindamycin	+
Erythromycine	+
Levofloxacin	+

S. S. S. was a 50 days-old when he fell ill, so he was in under-vaccinating age. Unvaccinated children are more prone to invasive pneumococcal disease. In Bulgaria two vaccines – Synflorix and Pneumo-23 – were accessible for protection against 85-97% of all strains of *S. pneumoniae*. Synflorix covered 1, 4, 5, 6B, 7F, 9V, 14, 18S, 19F and 23F serotypes of *S. pneumoniae* [20]. Synflorix was introduced in Bulgarian National immunization calendar for the first time in April, 2010. It is an obligatory free of charge vaccine. It is applied after second month three times at an interval of 30 days. Six months later forth buster dose is given.

Independently of recent therapeutic progress *S. pneumoniae* meningoencephalitis leads to high mortality and severe neurological sequels in survivors. Neurological sequels have been described in 25 to 56% of survivors. Mortality rate varies up to 25% [21]. The antimicrobial sensitivity of a positive Gram stain is 67% [22]. We used the right antibacterial treatment according to the antibiogram. The lack of success could be explained by shown *S. pneumoniae* large sensibility was only *in vitro*.

Microbiological investigation showed *S. aureus* of parents nasal swabs. As mentioned above they had some catarrhal symptoms 7 days before the start of their child's illness. The signs and symptoms of meningitis normally developed 3-7 days post-exposure [17]. It was known that when *S. pneumoniae* and *H. influenzae*, the both of them are placed together at the nasal cavity, *S. pneumoniae* always overpowered *H. influenzae* [23]. It was proven by *in vitro* investigations. We supposed that between *S. aureus* and *S. pneumoniae* could be existed the same interaction in spite of the known data [24]. This argument may explain the presence of *S. aureus* in nasal swabs of the parents. Being healthy carriers of *S. pneumoniae* they were the eventual source of infection.

Conclusion

Described case of *S. pneumoniae* meningoencephalitis was an illustration of how a fed breast child died of a vaccine-preventable disease only 10 days before achieving the vaccinating age. In spite of using the current antibacterial treatment according the antibiogram, the outcome was fatal. Because of limited surrounding we considered that parents were more likely the source of infection. Applying of vaccine against *S. pneumoniae* for adults – Pneumo-23, Pneumovax 23, or Prevenar 13 - could eliminate translation of infection.

Declarations

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Competing interests

None

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