Early-onset neonatal sepsis caused by *Streptococcus pneumoniae* serogroup 8

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Introduction

The National Institute for Health and Care Excellence (2012) guidelines define early-onset neonatal sepsis as infection occurring within 72 hours of birth. In the UK, the incidence of early-onset neonatal sepsis is 0.7/1000 live births and it accounts for 5.6 neonatal admissions per 1000 live births (Cailes et al, 2018). Group B streptococcus (43%) and *Escherichia coli* (18%) are the most commonly isolated organisms (Cailes et al, 2018). *Streptococcus pneumoniae* is an uncommon cause of early-onset neonatal sepsis, accounting for 2 out of 124 (1.6%) cases (Vergnano et al, 2011). This article describes a case of early-onset neonatal sepsis caused by *S. pneumoniae* that most likely occurred via vertical transmission from the mother.

Case Report

A 34-year-old multigravida woman had a spontaneous vaginal delivery of a 3.82 kg female infant at 39^{+3} weeks gestation following a pre-labour prolonged rupture of membranes of 33 hours. The mother felt unwell with rigors 24 hours pre-delivery but remained apyrexial. Before delivery she was commenced on intravenous cefotaxime and metronidazole for possible chorioamnionitis or puerperal sepsis. Her C-reactive protein level pre-delivery was 41 mg/litre with a leucocytosis (13.5×10^9/litre) and raised lactate level (3.1 mmol/litre).

At 3–4 minutes of life, the infant became tachypnoeic and developed an increased oxygen requirement. She was admitted to the special care baby unit for further management. Her initial blood glucose level was 0.6 mmol/litre and following two 10% dextrose boluses the hypoglycaemia resolved. In view of the maternal history and risk factors, early-onset neonatal sepsis was considered and intravenous benzylpenicillin and gentamicin were started after obtaining a blood culture. The infant required respiratory support with high flow oxygen for the first 72 hours. Chest X-ray showed airspace consolidation bilaterally.

The infant's initial C-reactive protein level was 11 mg/litre, peaking at 77 mg/litre. Blood culture results at 19 hours confirmed growth of *S. pneumoniae* with minimum inhibitory concentration 0.03 mg/litre (fully susceptible). The mother's high vaginal and placental swabs both grew the same serotype of *S. pneumoniae* which was also penicillin sensitive. Lumbar puncture at 48 hours of age showed no pleocytosis, no growth on CSF culture and pneumococcal polymerase chain reaction was negative. Gentamicin was discontinued after 48 hours and the infant completed a 10-day course of intravenous benzylpenicillin with a further 4 days of oral beta-lactam antibiotics at home. Repeat blood cultures from day 9 of treatment showed no growth. At review 8 weeks later the infant was growing and developing well.

Discussion

The isolate from the neonate was *S. pneumoniae* serotype 8, which has been reported as a cause of early-onset neonatal sepsis in only two cases (Geelen et al, 1990). Serotype 8 is not included in the pneumococcal conjugate vaccine (PCV13) administered to infants in the UK, but is a component of the pneumococcal polysaccharide vaccine (PPV23), which is administered to adults over 65 years and at-risk groups aged ≥2 years (Public Health England, 2018). Providing PPV23 during pregnancy may reduce neonatal infection, but a Cochrane review by Chaithongwongwatthana et al (2015) found insufficient evidence to recommend routine use.

S. pneumoniae is not a common vaginal commensal (carriage rate 0.03–0.75%; Alsubaie, 2019). A literature review by Alsubaie (2019) identified 60 neonates aged <7 days over a 47-year period (1970–2017) with *S. pneumoniae* bacteraemia; maternal vaginal swabs were positive for *S. pneumoniae* in 24 cases. Potential risk factors were premature rupture of membrane, maternal pyrexia, chorioamnionitis, pneumonia, maternal meningitis, maternal sepsis with *S. pneumoniae*, or endometritis progressing to bacteraemia. In the current case, the mother most likely had puerperal sepsis.

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Learning points

- *Streptococcus pneumoniae* remains a rare cause of early-onset neonatal sepsis and is associated with high mortality rates.
- A combination of benzylpenicillin and gentamicin remains the initial antibiotic of choice when resistance is low or when meningitis is not suspected.
- Providing the pneumococcal polysaccharide vaccine in pregnancy has the potential to reduce the number of cases but at present, evidence does not support its use.

S. pneumoniae infections in the neonate are associated with a high mortality rate of up to 60% (Hoffman et al, 2003). *S. pneumoniae*-related early-onset neonatal sepsis has a poorer prognosis than late-onset and is likely to be associated with death, especially within 36–48 hours of life (Hoffman et al, 2003; Sallam and Paes, 2004).

In a case series of 29 neonates with *S. pneumoniae*-related sepsis (3 had early-onset neonatal sepsis) over an 8-year period (1993–2001) 21.4% of isolates were penicillin non-susceptible and 3.6% were also ceftriaxone non-susceptible (Hoffman et al, 2003). In areas where penicillin resistance is more common or where meningitis cannot be excluded vancomycin and/or high-dose cefotaxime is recommended (Hoffman et al, 2003; Alsubaie, 2019).

Conclusions

Because of the low incidence of *S. pneumoniae*-related early-onset neonatal sepsis and the low prevalence of maternal vaginal colonisation, neither systematic screening nor immunisation is recommended in pregnant women. The best approach is early diagnosis and appropriate antimicrobial treatment for neonates based on local epidemiology and microbial sensitivities. Surveillance studies and evaluation of risk factors for *S. pneumoniae* infection are warranted.

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