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ORIGINAL ARTICLE

Streptococcus Pneumoniae: The Forgotten Microorganism in Neonatal Sepsis

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Streptococcus pneumoniae is a rarely cause of neonatal sepsis. Its prevalence is low but with a mortality of 50%. Measures to prevent *Streptococcus agalactiae* transmission could help to increase Invasive Pneumococcal Disease (IPD) in newborns. Transmission could be from mother intrapartum; or in those cases of late onset sepsis, the community carriers. Systematic vaccination with PCV-7 and PCV-13 has reduced IPD rates. We present a case of a newborn with no perinatal risk factors for infection. In the first 24 hours after surgery of an ovarian cyst, the patient started with bad general condition with fever and regular perfusion. Empiric antibiotic treatment was started. *Streptococcus pneumoniae* was isolated in blood culture.

Conclusion: In neonatal sepsis, we always think in *Streptococcus agalactiae*. *Streptococcus pneumoniae* is rare but with a high morbidity and mortality. Systematic vaccination is a measure that has demonstrated a reduction in the incidence of Invasive pneumococcal disease.

Keywords: *Streptococcus pneumoniae*, newborn, sepsis.

INTRODUCTION

Streptococcus agalactiae (S. agalactiae/SGB) is the main microorganism isolated in neonatal sepsis (33%). It is followed by other agents like *Escherichia coli* (32%) and *Listeria monocytogenes* (7%). A well-known microorganism in childhood but forgotten in newborns is *Streptococcus pneumoniae (S. pneumoniae)*. It is the most common cause of bacterial pneumonia, meningitis and sepsis in children [1]. It is also an important etiology in neonatal sepsis; although its prevalence is low (1–11%) [2, 3, 4]. Everything known about this agent during the newborn period is by isolated cases or small series[5]. The high morbidity rate (neurological disability or sequelas 13%) [6] and a mortality rate of 50-60% [4] is significant especially [2,6,7] in these newborns with suspected sepsis from negative recto-vaginal swabs mothers or who received *S.agalactiae* antimicrobial prophylaxis during labor [2].

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CASE REPORT

The female infant was born by cesarean section at 38 + 4 weeks gestation. The infant weighed 3110 g with Apgar scores of 9 at 1 and 10 at 5, respectively. No resuscitation at delivery was required. There were no risk factors for sepsis. Vaginal-rectal swab culture was negative for SGB, amniotic fluid as clear with rupture of membranes during cesarean section.

A left ovarian cyst (80 mm in diameter) was detected in prenatal ultrasound. After birth, the infant stayed with her mother. Postnatal ultrasound on the first day of life revealed an anechoic cyst lesion in pelvis with extension to epigastrium. Its measurements were 93 × 45 × 50 mm, suggestive of a possible left ovarian cyst.

Surgery was performed six days later. A laparotomy with cyst punction and evacuation, and partial capsulotomy were done. There were no incidences during surgery.

After surgery the infant was admitted to the NICU. The first 24–36 hours of stay in NICU, the patient started with febricula, feeding reluctance and regular perfusion. C-reactive protein was 57.6 mg/l. A lumbar puncture was done with normal biochemistry. Empirical intravenous vancomycin and cefotaxime was given over 7 days. Abdominal incision showed no inflammatory signs. The umbilical cord was slightly hyperemic. CSF culture was negative. Blood culture was positive for *S.pneumoniae* sensitive to vancomycin and cefotaxime. The infant's course was good and was discharged home at 15 days of life.

DISCUSSION

Streptococcus pneumoniae is a microorganism that plays an important role in the etiology of newborn sepsis. Its prevalence is low but it causes an important morbidity-mortality. Signs and symptoms of pneumococcal neonatal sepsis are similar to SGB sepsis [2, 6]. Other differential diagnoses could be osteomyelitis or septic arthritis [4].

The way *S.pneumoniae* reaches the newborn has generated different theories. The increased risk factors for SGB sepsis does not appear to be for pneumoncocal sepsis unless through vaginal labor, the only one proven factor [3]. It is assumed a transmission is from the birth canal.

The origin of the infection is from the birth canal (ascending) or from the placenta (hematogenous) could explain the cases of early onset sepsis (EOS) [1, 2, 4, 6, 8]. *S.pneumoniae* is not considered to be part of the normal vaginal flora (colonization in genital tract is less than 0.03% [9]) but a transient colonization can occur (pelvic infection if a predisposing condition exists, use of intrauterine contraceptive devices, recent birth or gynecological surgery [2, 3, 4], or changes in sexual practice [2, 4]). A theory of unbalanced vaginal flora related to a decrease or disappearance of *Lactobacillus* has been described as an explanation of pneumococal colonization [6]. *S.pneumoniae* is not usually detected in routine recto-vaginal swabs for *S.agalactiae* screening during pregnancy. Even in the absence of symptoms (mothers are frequently asymptomatic) [4], antibiotic therapy should be strongly considered for the mother and the infant [4,7].

There is an increase in the pneumococcal resistance to penicillin and third generation cephaloporins. The frequent use of antimicrobials for the prophylaxis against group B streptococcus can select more-resistant pathogens [3, 4, 7, 8] (20-50% for penicillin of those isolated in the newborn and 4-7% for third generation cephaloporins) [2].

The source of acquisition of pneumococci in late-onset infections is not clear [3]. Most of the cases of pneumococcal neonatal sepsis described in the literature occur during the second or third week of life [2, 9]. *S.pneumoniae* is present in more than

50% of the healthy population in the respiratory tract. The primary colonization site in humans is the nasopharynx [1].

There is certain suspicion of the role of the community. A horizontal transmission from siblings and other adults may occur [3]. However, there is limited information on the frequency of nasopharyngeal colonization in newborns [1].

Since the beginning of vaccination against *S.pneumoniae* in childhood, there has been a reduction of pneumococcal transmission in the general population, and consequently, in the prevalence of neonatal invasive pneumococcal disease [5].

In Spain, serotypes 7F, 1 and 19A were the most prevalent in invasive infections in 2010, when PCV13 was released [9]. Infecting serotypes reported includes 19,9,3,18,1,6,14,5 and 12. Serotypes responsible for 26% of invasive pneumococcal infections in neonates are 1, 3, 5 and 12 which are not included in the 7-valent pneumococcal vaccine [4].

In Madrid, *S. pneumoniae* vaccine was included in the systematic childhood vaccination calendar from the end of 2006 to 2013; at first with PCV7 vaccine, and since 2010 with a PCV13 valent. Vaccinations are done at 2, 4, 6 months of age and a fourth dose to 12-15 months of age. Since June 2012, vaccination against *S.pneumoniae* is not universal and this is predicted to cause a rebound in the number of IPD cases to the pre-PCV7 level[10].

The results of 6-years of surveillance of Pneumoccal invasive disease (IPD) of Heracles Study, developed in Madrid Autonomous Community (2007-2013), revealed IPD was not reduced in the heptavalent pneumococcal conjugated vaccine (PCV7) era. Rates of PVC7-serotypes decreased, although the total rate of IPD was not reduced by the effect of those serotypes not included in the vaccine (mainly 1, 7F and 19A) [10]. In other populations, the rates of IPD in young infants after introduction of PCV7, decreased significantly, providing evidence that vaccinating children aged 2 to 23 months had led to changes in pneumococcal carriage in infants too young to receive PCV7. Rates of PCV7-serotypes isolates decreased significantly (from 7.3 to 2.4 per 100.000 live births) while rates of non-PCV7 serotypes remained stable [1].

In the period immediately after the change to PCV13 vaccine (2010-2011), the Heracles Study revealed significant reductions in the incidence rate of IPD for all age groups. These reductions were mainly by a decrease of cases caused by serotypes 1 and 19A, included in the PCV-13. Non-CV13 serotypes did not increase in the PCV13 period [10].

Universal vaccination in childhood could create a community protected with a decrease in the incidence of invasive pneumococcal disease; also in those not vaccinated, such as newborn. Routine vaccination of healthy infants less than two years could prevent an important number of pneumococcal infections and reduce related morbidity and mortality [1].

Another targeted group to establish measures to decrease IPD rates is in childbearing women. Maternal immunization with pneumococcal vaccine could prove useful [8].

Vaccination to pregnant women with 23-valent polysaccharide vaccine or the 7-valent conjugated vaccine during the third trimester of gestation could be a measure [8]. There could be a transmission of antibodies to the baby via placenta, conferring immunization until the newborn starts the systematic vaccination calendar. Mothers of infants affected by early onset pneumococcal sepsis that have low pneumococcal antibody levels run the risk of subsequent infants being similarly affected; and vaccination should be considered to prevent recurrences [4]. There are no conclusive studies to promote pneumococcal vaccination during the pregnancy [3,8].

CONCLUSION

In neonatal sepsis, we think *Streptococcus agalactiae*; but there are other microorganisms implicated in its etiology. This is a case of *Streptococcus pneumoniae*, infrequent but with a high morbidity and mortality rates. We should consider it in cases with no risk factors for neonatal sepsis.

Systematic vaccination is a measure that has demonstrated a reduction in the incidence of invasive pneumococcal disease.

Declaration of interest

There is no conflict of interest for this work.

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