A Case of Invasive Pneumococcal Disease: CSF & Blood Culture Guiding Correct Diagnosis.

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Abstract :

Invasive pneumococcal infection, categorized as an infection by *Streptococcus pneumoniae* in a normally sterile site, is a not so rare occurrence in the paediatric age group, especially the infants. Low immune levels of this vulnerable age group predispose to increased rates of infection & if unchecked, may progress to secondary infections elsewhere in the body. We present here a case of an infant having invasive pneumococcal infection with involvement of the meninges and the circulatory system.

Key Words : Bacteraemia, invasive pneumococcal infection, meningitis, paediatric.

Introduction :

Bacterial meningitis is an infection of the meninges by bacteria. In children aged 3 months or more, the most frequent causes of bacterial meningitis include *Streptococcus pneumoniae* and *Haemophilus influenzae* type b. In the western world, since the development of the H. *influenzae* type B vaccine, the most common bacterial pathogen for community-acquired meningitis is *Streptococcus pneumoniae* which has a fatality rate ranging from 19% to 37%. In patients who survive the initial insult, neurologic sequelae including seizures, hearing loss, impaired mental status etc. can occur in approximately 30% of cases. Pediatric infections caused by S. *pneumoniae* include otitis media, sinusitis, occult bacteremia, pneumonia, meningitis, osteomyelitis, septic arthritis, pericarditis, and peritonitis. [1] Among these, meningitis bears the burden of case fatalities almost alone. The patient commonly presents with fever with/ without signs of meningitis. In the latter cases, diagnosis becomes difficult furthering the graveness of meningitis.

Case report :

A 7 month old female infant was admitted to a tertiary care hospital with complaint of fever mild to high grade, with 2 - 3 spikes per day, increased frequency of stool & vomiting. There was no history of convulsions. The patient had uneventful birth history with anthropometry and development within normal range. She was not breastfed since birth.

On examination, the patient was drowsy and febrile with tachycardia and tachypnoea. Nuchal rigidity was present. Laboratory parameters of the patient showed grade 2 microcytic hypochromic anaemia(Hb-5.6 gm/dl) with neutrophillia (92 %) and elevated C Reactive Protein at >10mg/dl . On 2nd day of admission there was an episode of excessive crying with arching of back followed by similar episodes with tonic clonic posturing and neck rigidity on subsequent days. The patient was immediately put on antibiotics (Inj. Ceftriaxone) and anticonvulsants. Lumbar puncture was done with the consent of parents and cerebrospinal fluid(CSF) sent to the laboratory for the investigations. Its biochemistry revealed increased proteins (173.90 mg/dl) and lowered sugar levels (15.0 mg/dl). Preliminary microscopy of CSF showed numerous gram positive, lanceolate diplococci, clearly hinting at the causative organism. The sample was cultured in duplicate and incubated aerobically and also in candle jar (5-10% CO_2). *Streptococcus pneumoniae* was isolated from the CSF; as also from the two sets of blood culture of the patient sent on the same day as CSF. The bacterium was confirmed from CSF and blood cultures both, with alpha-hemolysis pattern on blood agar, optochin sensitivity and bile solubility. The strain was found to be sensitive to all antibiotics, including penicillin, by standard Kirby-Bauer method. Inj. Ceftriaxone was continued for 14 days. Repeated investigations at regular intervals showed improved laboratory parameters with clearing of CSF; no bacteria being isolated on 15th day of admission. The isolated strain of S. pneumoniae was sent for serotyping to Christian Medical College, Vellore. The strain identified was serotype 27.

Discussion :

Globally every year, pneumonia kills more than 1 million children less than 5 years of age. [2] Pneumonia accounts for nearly one fifth of childhood deaths worldwide, majority

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of deaths occurring in Africa and South-East Asia.[3] As of March 2012, the World Health Organization estimates that globally there were 541,000 (uncertainty range: 376,000 - 594,000) global child deaths due to *S. pneumoniae* infections among those under 5 years. [4] These data are alarming enough to understand the need to address the issue of invasive pneumococcal infections in children.

S. pneumoniae is a gram positive, facultative anaerobic, encapsulated diplococcus. The polysaccharide capsule is an essential virulence factor for invasive pneumococcal disease. Pneumococci are commensals of the respiratory tract, hence can easily invade a hypo- immune host. Bacteremia without a known site of infection is the commonest invasive clinical presentation of pneumococcal infection among children of age 2 years or less, accounting for approximately 70% of invasive diseases in this age group. With the decline of invasive Hib disease, *S. pneumoniae* has become the leading cause of bacterial meningitis among children younger than 5 years of age. [5] And since the introduction of the pneumococcal conjugate vaccine in 2000, the overall incidence of invasive pneumococcal disease in infants and children has decreased significantly in developed nations like the USA, Australia. [6, 7]

Clinical diagnosis of bacterial meningitis is difficult in infants due to absence of signs of meningeal irritation. Low immune levels of the infant attributable to anemia and no breast feeding since birth, might have predisposed her to the infection. As a diagnostic tool, lumbar puncture should be strongly considered for infants 12 months of age because meningeal signs in these age groups may be minimal or absent. [8] Laboratory diagnosis is based on growth in culture media & hence, is feasible in most clinical microbiology laboratories and forms the mainstay. Isolation of the same bacteria from multiple samples and sites reinforces & correlates the diagnosis. In previous studies, 80% to 88% of children with non pretreated CSF-positive *S pneumoniae* meningitis had positive blood-culture results. [9]

Further serotyping may be done to identify the strain. Serotype 27 was identified as the causative strain of *S. pneumoniae* in the presented case; it would be remarkable to note that the pneumococcal conjugate vaccines (PCV) commonly administered globally do not contain this serotype [10, 11]. Some epidemiologic studies have reported concurrent increases in nonvaccine serotypes. [7]

A very disturbing hindrance coming on the forefront with regards to PCV is the presence of > 90 serotypes of *S. pneumoniae*, which can hardly be ever encompassed in a single vaccine, unless a tremendous vaccine breakthrough comes along. Again, if we scrutinise the Expanded Program on Immunisation (EPI), there is no provision for PCV. On the other hand, the Indian Academy of Paediatrics (IAP) in its IAP immunisation time table 2012, has recommended 3 doses of PCV at 6, 10 and 14 weeks to be followed by a booster at 15 months[12]. Going by the India specific estimates for the year 2005; 1, 36,000 deaths (46,000-2, 53,000) caused by pneumococcal diseases comprised 10 % of deaths in Indian children aged 1-59 months. [13] With this data, inclusion of PCV in EPI may well be a welcome sign.

The choice of initial antimicrobial therapy is based on the most common bacteria causing the disease according to the patient's age and the clinical setting and on patterns of antimicrobial susceptibility.

Conclusion :

Bacterial meningitis is a medical emergency in which early diagnosis and treatment is imperative to prevent death and reduce long-term complications. The neonates and infants commonly present with fever as the only complaint; thereby making the task of identifying the system involved difficult. Any delay in action may well increase morbidity and mortality.

Good clinical suspicion, following standardised guidelines and prompt and meticulous plan of action are the mainstay in such cases. Blood culture, as showcased in this case, is an integral part of the diagnostic spectrum; especially in cases of Pyrexia of Unknown Origin (PUO) and remains a gold standard.

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