Neonatal meningitis complicating with pneumocephalus

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ABSTRACT
Pneumocephalus is a rare condition characterized by the presence of gas within the cranial cavity. This gas may arise either from a trauma, a tumor, a surgical, or a diagnostic procedure or occasionally from an infection. Pneumocephalus as a complication of bacterial meningitis, in absence of trauma or a procedure, is extremely rare, particularly in a newborn. A case of pneumocephalus occurring in a baby, suffering from neonatal meningitis, acquired probably through unsafe cutting and tying of the cord, is reported here. Cutting, tying, and care of the umbilical cord is of utmost importance to prevent neonatal infection as the same is a potential cause of serious anaerobic infections, besides tetanus.

Key words: Gas producing organisms, meningitis, pneumocephalus

Introduction
Pneumocephalus is a rare condition characterized by the presence of gas within the cranial cavity. It may arise from trauma, tumors, following surgery or some diagnostic procedures and rarely from infection. In the absence of injury and surgery, spontaneous pneumocephalus secondary to meningitis, caused by a gas producing organism, is rather a rare occurrence. We report here a case of pneumocephalus occurring in a neonate suffering from meningitis, who died within 48 hours of hospitalization.

Case Report
A 7-day-old male newborn was brought to the casualty with complaints of refusal to feed and progressive increase in head size for the last 3 days. In view of his critical condition, the baby was immediately put on ventilator with supportive management. History revealed that though the mother had received two doses of tetanus toxoid during the second trimester of pregnancy, and rest of her antenatal period was also uneventful, the baby had been home delivered wherein a blade and the common home thread had been used for cutting and tying the umbilical cord. The baby had cried immediately after birth and was on breastfeeding since then, but he started refusing feed from the fourth day onwards, besides a gradual increase in the head size. On examination, the baby was hypothermic, pale, and had an enlarged head (39 cm). The umbilical cord had fallen on the 5th day of life, but the area showed signs of inflammation. His heart rate was 130/min, respiration was irregular, and capillary refill time (CRT) was >3 seconds. His blood glucose was 33 mg/dL. Results of the laboratory investigations done on his blood were as follows: Hemoglobin (Hb) - 13.9 g/dL, total leukocyte count (TLC) - 6.800 × 10^3/μL with neutrophils (N) 75% and lymphocytes (L) 25%, platelets - 85 × 10^3/μL, C-reactive protein - 20 mg/dL, total serum bilirubin - 8 mg/dL (direct 4 mg/dL), urea - 20 mg/dL, creatinine - 0.8 mg/dL, sodium - 142 mmol/L, potassium - 5.6 mmol/L, prothrombin time - 30 s (control - 15 s), and activated partial thromboplastin time 42 s (control - 30 s). In view of the enlarged head, bulging anterior fontanel and widely spaced cranial bones, congenital hydrocephalus, intraventricular hemorrhage, septicemia with meningitis, and battered baby syndrome were thought of as possible conditions. As his neurosonogram showed air like...
densities, a plain computed tomography (CT) scan of brain was done which revealed diffuse pneumocephalus along with large amount of air in subdural and subgaleal spaces, besides showing hemorrhages and meningeal enhancement in the region of posterior fossa [Figure 1]. The diagnosis was clear now, that we were dealing with a case of meningitis with pneumocephalus and there was hardly any other possible differential diagnosis.

A lumbar puncture (LP) was then done and his cerebrospinal fluid (CSF) examination showed cells - 550/μL (with N - 85%, L- 15%), glucose - 35 mg/dL, and protein - 228 mg/dL; the CSF and blood cultures were negative. In view of his critical condition, the baby was put on vancomycin (20 mg/kg/dose q8h, intravenous (IV)), meropenem (40 mg/kg/dose q8h, IV) along with supportive management. An attempt to decompress tension pneumocephalus was also made by putting an 18 G needle in subgaleal plane, from which air came out under pressure. However, despite all this, the condition of the baby failed to show any improvement and he succumbed within 48 h of being brought to the hospital.

**Discussion**

Pneumocephalus is usually associated with head trauma or tumor of the skull base; it may follow a neurosurgical or otorhinological procedure and rarely occurs spontaneously.[3] In a review of 290 patients of pneumocephalus, trauma was the principle etiological factor, being responsible for 73.9% of cases, other causes being tumors (12.9%) and surgical interventions (3.7%); infection accounted for 8.8% of cases only.[1] In the present case, there was no history of trauma, evidence of a tumor, or breech in sinus plates; as seen in CT. LP can also be ruled out as a cause as pneumocephalus was noticed on brain CT before doing LP. All this makes clear that pneumocephalus in the present case was secondary to meningitis, though no organism was grown on CSF culture. Meningitis caused by gas producing organisms, for example, *Clostridium perfringens*, *Bacteroides fragilis*, *Escherichia coli*, *Klebsiella aerogenes*, *Enterobacter cloacae*, and by mixed aerobic-anaerobic infection may cause pneumocephalus.[4,5] In the present case, no organism was grown either on CSF or blood culture. Moreover, anaerobic organisms fail to grow by usual laboratory methods as they require specialized microbiologic techniques.[9]

Treatment of pneumocephalus depends on the degree and progression of air collection and of course the etiology. Most cases resolve with conservative management, while surgical intervention is indicated in continued CSF leak or progression to a tension condition.[10] In the present case, needle decompression was done twice, though without bringing any improvement. The cause of death in this baby was due to raised intracranial tension secondary to meningitis and septicemia which was evident by abnormal respiratory pattern, dilated pupils with sluggish reaction, hypothermia, and increased capillary refill time.

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**References**

Kumari and Agrawal: Neonatal meningitis with pneumocephalus


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