Infected Cephalohematoma Caused by 
*Salmonella* Infection

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*A case of a 1-month-old child with cephalohematoma infection due to group B salmonella is reported. A progressively growing cephalohematoma was noted and salmonella infection was proven by cephalohematoma fluid and blood cultures. The child responded well to frequent needle aspiration of the growing cephalohematoma and antibiotic treatment.*

Key words: infected cephalohematoma, *Salmonella* infection, extra-intestinal salmonella infection

Case Report

A 35-day-old male infant was brought to the emergency room due to fever of 38.3°C, irritable crying, and poor activity for 1 day. His mother noted a recent increase in the size of a cephalohematoma in the right parietal area. No upper airway infection or diarrhea was found. There was no recent travel history.

He was formula fed using boiled water. No family members had a recent history of fever, diarrhea, or other disease. He was born vaginally at the gestational age of 42 weeks. Body weight at birth was 2930g. Bilateral cephalohematoma over the bilateral parietal area was noted at birth. The mass over the left side gradually subsided, but the mass over the right side showed enlargement in the few weeks before admission. Physical examination demonstrated a large, well-defined, purulent mass, about 8 x 9 cm in size, over the right parietal-occipital area (Fig. 1). No skin erosion or wound was observed over the scalp. The anterior fontanel was flat and neurological examination revealed normal findings. Other physical examinations were also normal.

The laboratory data revealed a white cell count of 14,100/mm³, hemoglobin 9.9 g/dl, platelet count 482 k/mm³, and C-reactive protein 4 mg/dl. Lumbar puncture for CSF study demonstrated normal findings. The brain computed tomography (CT) scan was performed on the 3rd day after admission. The result showed subscalp fluid accumulation with an outer layer high-density band over the right parieto-occipital region. No intracranial mass, bleeding or evidence of osteomyelitis was found via CT scan (Fig. 2). The same day, diagnostic needle aspiration of the cephalohematoma was performed, and 25 ml of dark red fluid was collected. Gram stain of the fluid revealed numerous polymorphonuclear neutrophils and gram-negative bacilli. The fluid and blood cultures grew group B salmonella.

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The infant was given ampicillin and gentamicin before culture results were obtained. He continued to have intermittent high fever and poor activity. We changed the antibiotic to ceftriaxone according to the results of the bacterial culture. The fever subsided and activity improved. Because the cephalohematoma had enlarged during hospitalization, we discussed this with pediatric surgeons who suggested repeated needle aspiration because it is a safer procedure with fewer complications while a scalp wound might be difficult to care for after surgery. Needle aspiration for drainage was performed three times during hospitalization and repeat fluid culture and blood culture 1 week later showed no bacterial growth. Although there was no diarrhea or gastrointestinal symptoms, stool culture was done and showed a negative finding for salmonella. He was discharged after 2 weeks of intravenous ceftriaxone and was given enough oral cefixime for 1 week to be administered at home. Upon follow up at our outpatient department 1 week after discharge, the cephalohematoma had shrunk and calcified. The infant’s body weight and activity had also increased.

Discussion

Cephalohematoma is common in newborns and almost always resolves spontaneously with no any sequelae. Sometimes, complications such as hyperbilirubinemia, subdural hematoma, or infection due to skin laceration or erosion occur. Seldom there is intracranial hemorrhage. Infection of a cephalohematoma is rare, and the most common infecting organism was Escherichia coli [1]. Salmonellosis is also not uncommon in the pediatric population. Gastrointestinal symptoms are the most common manifestation of this type of infection. In fact, extra-intestinal manifestations are not often seen, and an infected cephalohematoma caused by a salmonella organism has never before been reported (based on a Medline search and a report by Huang et al. [1]).

The salmonella organism is a motile, flagellated, nonencapsulated, gram-negative bacillus of the Enterobacteriaceae family. According to the Kaufmann-White Scheme, the salmonella serogroup B includes the serotypes S. agona, S. derby, S. heidelberg, S. saint-paul, S. paratyphi B, and S. typhimurium. Salmonella can be transmitted to humans by ingestion of contaminated food, milk, or water; by person-to-person spread (fetal-oral route); by contact with infected animals; or by contaminated medical instruments, dyes, or medications [2]. Increased susceptibility to salmonella infection is thought to be due to several factors: prolonged exposure to the organism, an impaired cell-mediated immune response, impaired phagocytosis, altered local protective factors, and the presence of diseased tissue [3,4]. Salmonella is an intracellular pathogen whose eradication involves natural killer cells and antibody-induced cellular cytotoxicity [5]. Neonates are at increased risk for symptomatic salmonella infection because they have immature immune systems, hypochlorhydria, and rapid gastric emptying times [6]. Our case had no skin erosion or wound over the scalp, no history of specific contaminated food or water ingestion, and no recurrent infectious history or recent family gastroenteritis history. At the time of presentation, the infant was only 35 days old. Thus, the salmonella-infected cephalohematoma may have been due to relative immunodeficiency. In addition, the accumulated fluid in the cephalohematoma provided a medium for bacterial growth.

In our case, the clinical manifestation was bacteremia with localized cephalohematoma suppurative infection. Localized suppurative infection occurs in approximately 10% of patients with Salmonella bacteremia. Localization may occur at almost any site and result in various clinical syndromes [7]. The most common sites of focal infection are bones, the brain and/or meninges, and lungs, followed by the kidneys, endocardium, pericardium, and joint spaces. Less common sites include the femoral and distal aorta (mycotic aneurysms), peritoneum, soft tissues, middle ear, scrotum, testicles, prostate, ovaries, and fallopian tubes [2].

Antimicrobial therapy for patients with Salmonella infection varies according to clinical syndrome, age and status of the patient, and antimicrobial susceptibility of the organism. Acute, asymptomatic infections and mild forms of gastroenteritis/enterocolitis in a normal host should not be treated with antibiotics. Fluid management and supportive care should be instituted in such patients. Antimotility agents act to prolong intestinal transit time and may cause systemic invasion by the organism. Antimicrobial agents may suppress normal intestinal flora and prolong the excretion of Salmonella, and have not been shown to decrease the duration of diarrhea symptoms. The use of antibiotics should be considered in patients with enterocolitis who are at high risk for develop-
pment of an invasive infection such as infants less than 3 months of age, patients who are immunocompromised such as those with AIDS, and patients with malignancies and hemoglobinopathies, including sickle cell anemia, or gastrointestinal tract dysfunction. Invasive salmonella infections including bacteremia with nontyphoidal strains and enteric fever should always be treated with antimicrobial agents. Ampicillin may be considered as the first-line therapy. Third-generation cephalosporins such as cefotaxime, ceftriaxone, and cefoperazone have been shown to be effective against salmonella strains resistant to ampicillin, chloramphenicol, and TMP-SMX. The duration of antibiotic therapy should be 2 weeks for bacteremia or enteric fever, 4 weeks for meningitis, and 4-6 weeks for osteomyelitis or other infections showing slow response to treatment. In our case, due to disseminated infection with a localized cephalohematoma suppurative infection, young patient age (less than 3 months old), and culture result showing resistance to ampicillin, we used third-generation cephalosporins to treat the patient. The clinical condition improved after antibiotic treatment [2].

Cephalohematomas almost always spontaneously resolve and require no treatment unless there are complications. For growing and calcified cephalohematomas, surgical drainage and removal has been reported [9]. Yamamoto et al suggested that aspiration is indicated for neonatal epidural hematomas with mild symptoms and for liquified cephalohematomas [8]. Also, Firlik and Adelson reported that the non-calcified cephalohematomas did not require open surgical intervention. Their report mentioned the indications for aspiration are as a workup for sepsis and to prevent calcification of a large chronic cephalohematoma, thereby preventing the possible need for surgery [10]. Needle aspiration for the growing cephalohematoma resulted in reduction of size in our case.

The baby recovered well and was discharged smoothly. We report this rare case to remind readers of the possibility of infected cephalohematoma by *Salmonella*. If prompt diagnosis is made, *Salmonella* bacteremia with infected cephalohematoma responds well to complete antibiotic treatment and frequent aspiration of the growing liquified cephalohematoma.

**References**