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Infected cephalohematoma associated with sepsis and scalp cellulitis: a case report

Hueng-Chuen Fan[1], Yi-Ming Hua[1], Chun-Jung Juan[2],Yu-Mieng Fang[3], Shin-Nan Cheng[1], Chih-Chien Wang[1]

Departments of [1]Pediatrics, [2]Radiology, and [3]Nuclear Medicine, Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan, ROC

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Infected cephalohematoma is rarely complicated by sepsis. We report a case of an infected cephalohematoma caused by *Escherichia coli* sepsis in an otherwise healthy neonate. Skull X-ray revealed soft tissue swelling over parieto-temporal region but no osteolytic lesion. ^{99m}Tc bone scan showed scalp cellulitis. Blood culture and scalp wound culture identified *E. coli*. Treatment with surgical incision and drainage and administration of antibiotics resulted in prompt improvement. The relationship of scalp cellulitis, infected cephalohematoma, and sepsis are discussed.

Key words: Cellulitis, sepsis, infected cephalohematoma

Cephalohematoma refers to a subperiosteal hemorrhage, which is usually the result of birth injury to the newborn infant [1]. Most cephalohematomas are benign and require no aggressive treatment. Complications include anemia [2], hyperbilirubinemia [3], calcification of a hematoma with resultant craniosynostosis [4], and underlying skull fracture [5]. The time of resorption of the hematoma varies depending on the size of this tumor, although it is usually gradually resorbed within 2 to 8 weeks after birth. Bacterial infection of a cephalohematoma is a rare condition that is usually associated with fetal scalp monitoring [6], needle aspiration [7], meningitis [8], and sepsis. Diagnosis is established by needle aspiration whenever an infected cephalohematoma is suspected. We report a case of infected cephalohematoma associated with *Escherichia coli* sepsis and scalp cellulitis in an otherwise healthy neonate. Surgical incision and debridement with appropriate antibiotics administration achieved complete recovery.

Case Report

A boy was born at full-term to a gravida 1, para 0 woman by a normal spontaneous vaginal delivery without vacuum extraction. His birth weight was 27 kg (23rd percentile); body length was 48 cm (37th percentile); head circumference was 34 cm (62nd percentile). His mother had no history of peripartal fever or chorioamnionitis, and the fetal membrane was ruptured less than 24 h before delivery. He was born at a local obstetric clinic in good health except for a cephalohematoma measuring 8 x 4 x 2 cm over the right parietal region, which had developed after birth. Sudden onset of fever (38.5-39°C) occurred when he was 2 days old. Because no abnormal finding was noted on physical examination, he was admitted to a local hospital when he was 4 days old. *E. coli* was isolated from a blood culture. His fever persisted despite intravenous administration of ampicillin 100 mg/kg/d and gentamicin 6 mg/kg/d for 3 days, and he was transferred to the Tri-Service General Hospital for further evaluation and treatment of *E. coli* sepsis on the 7th day of life.

His vital signs included a body temperature of 36.9 °C, a pulse rate of 142 bpm, and a respiratory rate of 44 breaths per min. Laboratory studies yielded the following values: hemoglobin, 12.7 g/dL; hematocrit, 37%; white blood cell count, 5510 cells /mm^3, with a differential count of 38.1% neutrophils, 52.5% lymphocytes, 7.4% monocytes, and 1.8% eosinophils; platelet count, 308 000 cells /mm^3; C-reactive protein, 19.21 mg/dL. Liver function and renal function tests were all within normal limits. The serum bilirubin level was 11.5 mg/dL in total with direct bilirubin of 1.7 mg/dL. The cerebrospinal fluid (CSF) appeared xanthochromic with a red blood cell count of 34 /mm^3, white blood cell count of 1 /mm^3, sugar 89 mg/dL, and

Corresponding author: Dr. Chih-Chien Wang, Department of Pediatrics, Tri-Service General Hospital, 325, Cheng-Kung Road, Section 2, Neihu, Taipei, 114, Taiwan, ROC. E-mail: ndmcccw@yahoo.com.tw

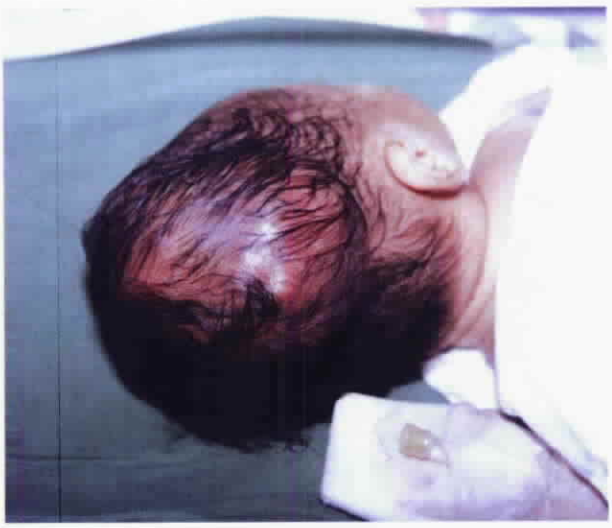

Fig. 1. Erythematous skin change and pustule-like lesions were observed on the cephalohematoma surface.

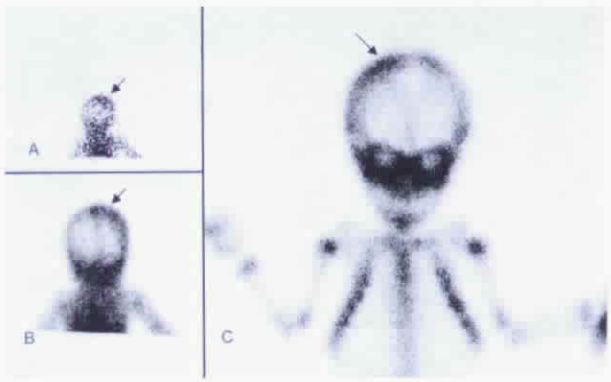

Fig. 2. Images of ^{99m}TC methylene diphosphonate (MDP) 3-phase whole-body bone scan were acquired 4 h after intravenous injection of 20 mCi of ^{99m}TC MDP. **(A)** Arterial phase (blood pool phase) demonstrated intense radioactivity over the right parieto-temporal region (arrow). **(B)** Tissue phase showed marked radioactivity over the right parieto-temporal region (arrow). **(C)** Only slightly increased uptake of radioisotope over the right parieto-temporal region was identified during the bony phase (delayed phase) of ^{99m}TC MDP bone scan (arrow).

total protein 88 mg/dL. Because blood culture revealed no bacterial growth, and urine and CSF were sterile, administration of ampicillin and gentamicin continued due to the *E. coli* susceptibility test result on the referral sheet.

Erythematous skin change and pustule-like lesions were observed on the cephalohematoma surface on the 12th day of life (Fig. 1). The infant became irritable and cried when the mass was touched. Cefotaxime 100 mg/kg/d combined with ampicillin 100 mg/kg/d were administered under the impression of infected cephalohematoma and suspicion of meningitis. The lesion enlarged progressively on the 14th day of life. Skull film did not show any osteolytic bone lesion. Arterial and tissue phases of ^{99m}Tc bone scan demonstrated intense radioactivity over the right parieto-temporal region, but bony phase of ^{99m}Tc bone scan showed only slightly increased uptake of radioisotope over the area of the cephalohematoma (Fig. 2). A pediatric surgeon performed surgical incision and drainage. Gram's stain of the drained pus revealed gram-negative bacilli. Culture of the pus grew *E. coli*. The antibiograms of each bacterial culture result indicated origination in the same colony. Because of the lack of evidence of bacterial meningitis, and the otherwise healthy clinical manifestations of this infant including good activity and feeding, antibiotic therapy was switched to intravenously administrated cefazoline 100 mg/kg/d and gentamicin 6 mg/kg/d according to the results of sensitivity tests. Complete recovery was achieved after the surgical procedure and adequate antibiotics administration for 3 weeks.

Discussion

Cephalohematoma is generally a benign condition and is commonly seen in the newborn. The incidence of cephalohematoma is about 1% to 2% of deliveries, and is about 3.9% to 4.3% following vacuum and forceps deliveries [9]. Most cephalohematomas are resorbed within 2 weeks to several months, depending on their size [2]. No treatment is required, but the condition should be carefully followed.

Infection of a cephalohematoma may occur spontaneously, or secondarily to contamination via fetal scalp monitoring [6], needle aspiration [7], or after sepsis and/or meningitis [8]. Although bacterial infection of a cephalohematoma is rare, the clinical features, including rapid enlargement, cutaneous erythema over the lesions, unexplained fever, leukocytosis, and radiolucencies of the skull bone on x-ray or cranial CT scan indicate a cephalohematoma has been infected [10]. Blom and Vreede [11] reported that *E. coli* was the most commonly encountered organism in infected cephalohematomas, whereas *Staphylococcus aureus*, *Pseudomonas aeruginosa*, coagulase-negative Staphylococci, *Salmonella typhimurium*, *Gardnerella vanimalis*, group B *Streptococcus*, and anaerobes were less common.

Antimicrobial therapy for infected cephalohematoma should be directed specifically to the organisms causing this disease. Most cases of infected

cephalohematoma are associated with sepsis and meningitis [8,10]. However, infected cephalohematomas may be complicated by osteomyelitis of the underlying skull or by meningitis associated either with sepsis or secondary to intracranial extension through an adjacent skull fracture or a cranial suture [12]. Radiographic studies and bone scan together may provide useful information in the differentiation between soft tissue and bone infection [13]. In cases with osteomyelitis, skull radiographs and computed tomography may depict focal osteolytic change of the involved calvarium, which may not present in cases with cellulitis only. Although intense radioactivity may present on bone scan in areas with osteomyelitis or cellulitis during the arterial and tissue phases, only cases with osteomyelitis show marked increased uptake of radioisotope in the bony phase. Cellulitis only demonstrates hyperemia in the blood pool phase, but in the delayed phase, normal or slightly increased uptake of radioisotope results in either a normal or a mild, relative increased uptake accumulation image [14].

Cases of infected cephalohematomas associated with sepsis have been reported [6-8,10,11], but the relationship between an infected cephalohematoma and sepsis is not clearly known. Whether the cephalohematoma is the source of sepsis and/or meningitis is not clearly established. In this patient, we could not establish whether the infected cephalohematoma served as an infectious focus causing the sepsis, or the bacteremia caused the hematoma to become infected. The latter scenario is more likely in that the inflammatory change in the hematoma developed later in the course of the sepsis, and the antibiograms of each bacterial culture were the same. Since blood clot in the cephalohematoma is a rich medium for the growth of the causative organism, we presumed that the cephalohematoma was the target, which was seeded by *E. coli* during the initial bacteremia.

The frequency of neonatal bacterial infections ranges from 1 to 5 per 1000 live births [15]. General agreement seems to exist with respect to management of infants with proven infection. However, management is more controversial for newborns whose presentations are considered equivocal, high-risk newborns who are asymptomatic, or febrile newborns without any risk factors for the development of neonatal sepsis. These risk factors include urinary tract infection, upper respiratory tract infection, maternal chorioamnionitis, rupture of membranes greater than 18 h, group B *Streptococcus* carriage, and foul-smelling amniotic fluid [16]. The patient in this report had no risk factors for neonatal sepsis. Gervaix *et al* [17] found that 4% to 5% of infants and young children with fever had no risk factor for sepsis. For the infant with persistent fever, administration of antibiotics should be continued until the results of blood, urine sample, and possibly CSF cultures have been obtained.

Although there is no indication for routine aspiration of cephalohematomas, diagnostic puncture using an aseptic technique should be considered in cases of infected cephalohematoma [10]. Aspiration and incision of cephalohematoma may induce risk of infection [18]. Infected cephalohematoma should be treated emergently because delayed recognition and management may lead to death. Adequate incision and drainage with appropriate antibiotics administration are mandatory [11]. Clinicians should be alert that the cephalohematoma may be infected if a septic infant presents with no other infectious symptoms or signs.

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