CASE REPORT

SEPTICEMIA, MENINGITIS, AND SKULL OSTEOMYELITIS COMPLICATING INFECTED CEPHALHEMATOMA CAUSED BY ESBL-PRODUCING *ESCHERICHIA COLI*

Narongsak Nakwan[1, 2], Narongwit Nakwan[3], Jeerawan Wannaro[2], Pathikan Dissaneevate[2], Supika Kritsaneepaiboon[4] and Kulkanya Chokephaibulkit[5]

[1]Neonatal Intensive Care Unit, [2]Department of Pediatrics, [3]Department of Medicine, Hat Yai Medical Education Center, Hat Yai Hospital, Songkhla; [4]Department of Radiology, Faculty of Medicine, Prince of Songkla University, Songkhla; [5]Division of Infectious Diseases, Department of Pediatrics, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

Abstract. An infected cephalhematoma is a rare condition in neonates. We report a case of an 18-day-old neonate who was diagnosed with an infected cephalhematoma caused by an extended spectrum beta-lactamase (ESBL)-producing *Escherichia coli* complicated with septicemia, meningitis, and skull osteomyelitis. He was successfully treated with meropenem and surgical incision and drainage. ESBL-producing *E. coli* may cause infection of a cephalhematoma in neonates.

Keywords: infected cephalhematoma, neonatal osteomyelitis, septicemia, neonatal bacterial meningitis

INTRODUCTION

Cephalhematoma is a fairly common complication of birth trauma, with an incidence of 0.5% of all live births (Hughes *et al*, 1999). It is associated with instrument delivery and prolonged labor (Hughes *et al*, 1999). A cephalhematoma usually resolved spontaneously within 4 weeks, however, complications, such as subarachnoid hemorrhage or infection of the cephalhematoma, have been previously reported (Hughes *et al*, 1999). The risk factors for infection of a cephalhematoma are the use of a fetal scalp electrode, and incision or aspiration of the hematoma, but infection may occur without those factors (Jacobson *et al*, 1960). Common organisms causing infection of a cephalhematoma include *Escherichia coli*, and *Staphylococcus aureus* (Chang *et al*, 2005). Some studies have reported anaerobic bacteria or *Gardnerella vaginalis* as causing an infected cephalhematoma (Nightingale *et al*, 1986; Brook, 2005). We report a neonate with an infected cephalhematoma complicated

Correspondence: Dr Narongsak Nakwan, Neonatal Intensive Care Unit, Department of Pediatrics, Hat Yai Medical Education Center, Hat Yai Hospital, Songkhla 90110, Thailand.
Tel: +66 (0) 81 8980546; Fax: +66 (0) 74 273161
E-mail: nnakwan@hotmail.com

with meningitis, septicemia, and skull osteomyelitis due to extended spectrum beta-lactamase (ESBL) -producing *E. coli*.

CASE REPORT

An 18-day-old male neonate was admitted to our neonatal intensive care unit (NICU) with an increasing bilateral parieto-occipital swelling and fever for 7 days prior to admission. He was born by spontaneous vaginal delivery at 39 weeks gestation to a 20-year-old mother following an uncomplicated pregnancy. Spontaneous rupture of membranes occurred 4 hours before delivery. The birth weight was 3,200 g and the Apgar scores were 9 and 10 at 1 and 5 minutes, respectively. Cephalhematoma was not noted at birth. The infant was well without jaundice and discharged on the third day of life.

On admission, the physical examinations revealed a fever of 38.3ºC and a large bilateral parieto-occipital cephalhematoma with tenderness and redness of the overlying skin. Examination of other organ systems was normal. His initial investigations revealed a hematocrit of 38%, a total white blood count of 20,100 cells/mm^3 (40% neutrophils; 56% lymphocytes; 2% atypical lymphocytes; 2% metamyelocytes), and a platelet count of 382,000 cells/mm^3. Analysis of cerebrospinal fluid (CSF) revealed 25 white blood cells/mm^3 (100% neutrophils), 1,750 red blood cells/mm^3, a glucose level of 52 mg/dl (blood glucose level of 222 mg/dl), and a protein level of 126 mg/dl. Blood chemistry, coagulogram, and urinalysis were within normal ranges. The skull roentgenogram antero-posterior view revealed a small area of ill defined osteolytic lesion representing cortical destruction of the left parietal bone (Fig 1A). Intravenous cloxacillin and gentamicin were started after obtaining cultures.

On Day 3 of hospitalization, the blood and CSF cultures grew ESBL -producing *E. coli*, susceptible to only meropenem and aminoglycosides. The antibiotic was changed to meopenam (120 mg/kg/day). Incision and drainage of the infected cephalhematoma was also performed. The pus culture grew the same organism. On Day 10 of treatment, a skull roentgenogram showed an increase in size of osteolytic lesion with a sclerotic border (Fig 1B). Meropenem treatment, was continued for 4 weeks.

A hearing examination found no evidence of hearing deficit, and cranial ultrasonography showed no evidence of hydrocephalus. He was discharged from hospital on Day 43. Follow-up examination at 18 months of age was normal without any sequelae.

DISCUSSION

Neonatal infection due to multidrug-resistant gram-negative bacilli (GNB) has recently emerged as an important nosocomial infection worldwide (Souli *et al*, 2008), causing morbidity and mortality. We reported a case of infected cephalhematoma complicated with septicemia, meningitis, and skull osteomyelitis due to ESBL-producing *E. coli*.

Chang *et al* (2005) evaluated the clinical course of infected cephalhematomas in 28 neonates. The most common clinical manifestations were local lesion, including erythema (79%), increasing size of the cephalhematoma (68%), and a fluctuant mass (46%). *E. coli* and *Staphylococcus aureus* were the most common pathogens found in 57%, and 18%, respectively (Chang *et al*, 2005). Other less common causes were *Gardernella vaginalis* and other anaerobic bacteria, such as *Peptostreptococcus* spp, *Prevotella* spp, *Bacteroides fragilis* group,

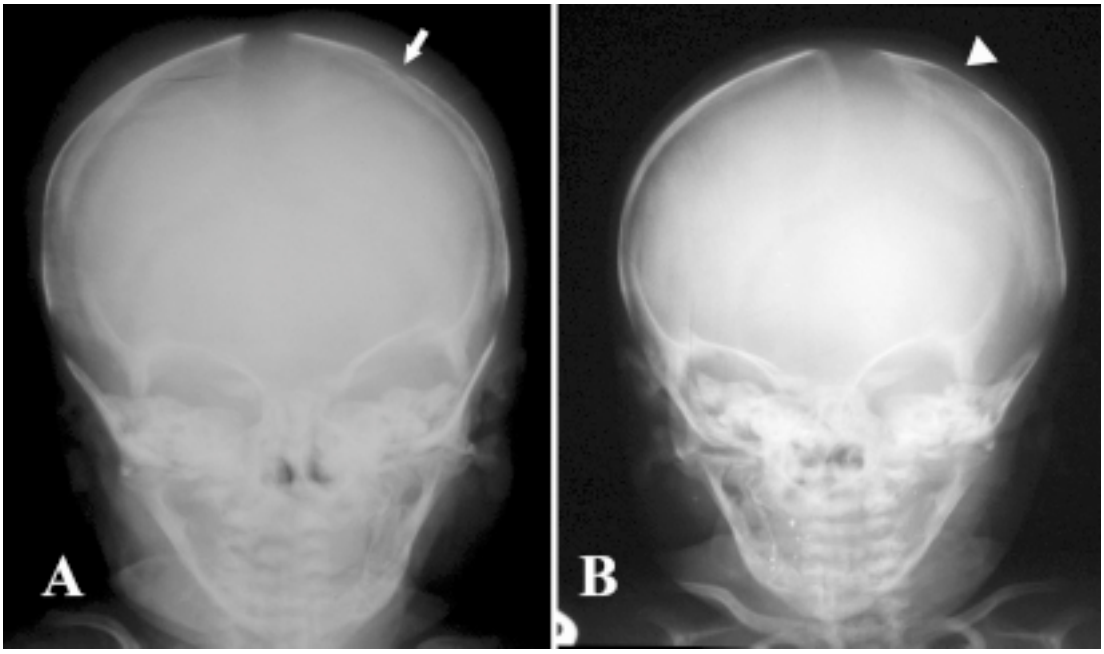

Fig 1–A) Anteroposterior view of skull radiograph on admission shows a small osteolytic lesion of the left patietal bone (arrow). B) Serial skull radiograph on Day 10 of hospitalization reveals an increase in size of the osteolytic lesion with a sclerotic border (triangle).

and *Propionibacterium acnes* (Nightingale *et al*, 1986; Brook, 2005).

The route of infection in our case is unclear. ESBL-producing *E. coli* is not a common pathogen in the maternal genital tract, from which most neonatal pathogens come. We postulate the bacteria became colonized on the infant skin and mucous membranes while staying in the hospital causing a systemic infection, including of the hematoma and osteomyelitis.

Several other cases of neonatal osteomyelitis had been reported with infected cephalhematomas (Mohon *et al*, 1986; Lee, 1990; Blom and Vreede, 1993; Kao *et al*, 1999). In our patient, the skull radiograph showed evidence of osteomyelitis on the day of admission. In cases without bony radiolucencies on skull radiographs, computer tomography may be needed to exclude osetomyelitis (Offiah, 2006). Early recognition of osteomyelitis is needed along with giving an appropriate dosage of antibiotic for an adequate duration of treatment. Appropriate antibiotic administration and open surgical drainage are the recommended treatment. The initial antibiotic choice should cover *E. coli* and *S. aureus*, then be guided by the culture results. In our patient, meropenem was used to treat the ESBL-producing *E. coli* (Paterson, 2000). The recommended duration of treatment is 3 weeks for neonatal bacteremia and meningitis. Treatment of osteomyelitis should be 4-6 weeks.

From a practical point of view, this case highlights two points worth further consideration: 1) the importance of early detection of an infected cephalhematoma

from vague signs and symptoms and 2) the recognition and appropriate management of neonatal osteomyelitis. ESBL-producing *E. coli* should be considered as a possible pathogen infecting cephalhematomas in neonates.

ACKNOWLEDGEMENTS

We thank the pediatric staffs, residents and nurses for caring for the patient.

REFERENCES

Blom NA, Vreede WB. Infected cephalhematomas associated with osteomyelitis, sepsis, and meningitis. *Pediatr Infect Dis J* 1993; 12: 1015-7.

Brook I. Infected neonatal cephalohematomas caused by anaerobic bacteria. *J Perinat Med* 2005; 33: 255-8.

Chang HY, Chiu NC, Huang FY, Kao HA, Hsu CH, Hang HY. Infected cephalohematoma of newborns: experience in a medical center in Taiwan. *Pediatr Int* 2005; 47: 274-7.

Hughes CA, Harley EH, Milmoe G, Bala R, Martorella A. Birth trauma in the head and neck. *Arch Otolaryngol Head Neck Surg* 1999; 124: 193-9.

Jacobson M, Lander HB, Spiegel IJ. Spontaneous infection of cephalhematoma with recovery. *J Pediatr* 1960; 56: 513-5.

Kao HC, Huang YC, Lin TY. Infected cephalohematoma associated with sepsis and skull osteomyelitis: Report of one case. *Am J Perinatol* 1999; 16: 459-62.

Lee PY. Infected cephalohematoma and neonatal osteomyelitis. *J Infect* 1990; 21: 191-3.

Mohon RT, Mehalic TF, Grimes CK, Phillip AGS. Infected cephalhematoma and neonatal osteomyelitis of the skull. *Pediatr Infect Dis* 1986; 5: 253.

Nightingale LM, Eaton CB, Fruehan AE, Waldman JB, Clark WB, Lepow ML. Cephalhematoma complicated by osteomyelitis presumed due to *Gardnerella vaginalis*. *JAMA* 1986; 256: 1936-7.

Offiah AC. Acute osteomyelitis, septic arthritis and discitis: differences between neonates and older children. *Eur J Radiol* 2006; 60: 221-32.

Paterson DL. Recommendation for treatment of severe infections caused by Enterobacteriaceae producing extended-spectrum β-lactamases (ESBLs). *Clin Microbiol Infect* 2000; 6: 460-3.

Souli M, Galani I, Giamarellou H. Emergence of extensively drug-resistant and pandrug-resistant Gram-negative bacilli in Europe. *Euro Surveill* 2008; 13: 1-11.