Delayed-onset Right Diaphragmatic Hernia of Newborn after Group B Streptococcal Pneumonia: a case report

Shih-Chieh Huang1 Shin-Lin Shih1,2 Yu-Peng Liu1,3 Fei-Shih Yang1,4

Department of Radiology1, Taipei Mackay Memorial Hospital
Department of Radiology2, Taipei Medical University
Mackay Medicine, Nursing and Management College3
Department of Radiological Technology4, Yuanpei University

A term, male newborn presented with severe respiratory distress and hypoxia 20 hours after delivery. Group B streptococcal (GBS) sepsis and pneumonia were diagnosed on postnatal day 2, and the patient was treated with antibiotics and mechanical ventilation. Extubation was performed on postnatal day 19, but the baby’s respiratory status deteriorated. Herniation of bowel loops into the right thorax was subsequently confirmed by barium study on postnatal day 26. The infant was operated on and recovered. This case illustrates the importance of considering this unusual entity. Early recognition will help avoid dangerous procedures such as thoracentesis, at the same time permitting early treatment that is associated with a good outcome.

An association in neonates between early-onset group B streptococcal (GBS) pneumonia and sepsis with late-onset right diaphragmatic hernia was first reported in 1975 [1]. The typical clinical presentation is of a near-term male neonate with GBS infection who develops respiratory deterioration after treatment of the infection. The diagnosis of diaphragmatic hernia is subsequently made. The radiological appearance of chest may be confused with other pulmonary problems, resulting in a delayed or missed diagnosis. Therefore, awareness of this association and appropriate examination for it are essential.

CASE REPORT

A term, male newborn born to a G2P2 mother via a normal vaginal delivery presented with respiratory distress 20 hours postnatally. His birth weight was 2700 grams and his Apgar scores were 8 and 9 at 1 and 5 minutes of age. The mother’s antenatal test results were unremarkable except for a positive hepatitis B profile. There was no documentation in the medical record of screening for GBS.

The baby was intubated immediately because of severe hypoxia. A chest radiograph taken on the first day of hospitalization showed bilateral parahilar and lower lung field infiltrates (Fig. 1). Blood and urine cultures were positive for GBS; a cerebrospinal fluid culture was negative. Follow-up chest radiograph on postnatal day 10 showed increased patchy opacities in both lung fields and obliteration of the right costophrenic angle (Fig. 2). The infant improved on treatment and was extubated on postnatal day 19. He was placed on nasal continuous positive airway pressure respiratory support along with continued antibiotics. However, respiratory deterioration occurred, and a follow-up chest radiograph showed increased haziness in the right hemithorax and leftward shift.
Delayed-onset diaphragmatic hernia of the heart. Abdominal ultrasound on postnatal day 25 revealed that the liver was higher and normal. On postnatal day 26, a barium meal demonstrated herniation of bowel loops into the right hemithorax (Fig. 3).

At surgery on postnatal day 27, a 7-cm right posterio-lateral defect in the diaphragm with a smooth margin was found. The liver, colon, and small bowel loops were within the pleural space, but there was no hernia sac. There was mild hypoplasia of the right lower lobe of the lung. The infant tolerated the procedure well and was discharged in stable condition.

**DISCUSSION**

This case illustrates the peculiar association in a neonate of early-onset GBS pneumonia with sepsis and the subsequent discovery of a right diaphragmatic hernia. Despite a number of reports of this association, the pathophysiologic mechanism remains unclear. It was initially suggested that the hernia resulted from necrosis and destruction on the diaphragm secondary to GBS infection [2]. However, many authors disagree because of the presence

---

**Figure 1.** Chest radiograph on postnatal day 1 showing bilateral lower lung and parahilar infiltrates.

**Figure 2.** Follow-up chest radiograph on postnatal day 10 showing increased opacities in both lungs and obliteration of right costophrenic angle.

**Figure 3.** Barium meal on postnatal day 26 showing herniation of bowel loops into the right hemithorax.
of a smooth-edged diaphragmatic defect, as we found in our case [3]. Another hypothesis posits a congenitally defective diaphragm that in some way makes the neonate more susceptible to secondary infection and pneumonia [3, 4]. The combination of the GBS-related pulmonary inflammatory process and positive-pressure mechanical ventilation initially mask the diaphragmatic defect. As the neonate’s respiratory status improves with treatment, the positive pressure is reduced, allowing the intra-abdominal organs to herniate through the defect. [5].

In 2007, Strunk et al. reviewed this phenomenon in 40 patients reported in the literature, finding that most patients are baby boys with a median gestational age of 37 weeks. The diagnosis of diaphragmatic hernia is made at a median postnatal age of 11 days [6]. The typical presentation includes transient improvement on antibiotics for GBS, followed by subsequent respiratory deterioration. Chest radiograph findings include hyperinflation, haziness, and increased densities in the lower lung field, predominately on the right side. These densities are easily mistaken for other pulmonary problems such as unresolved pneumonia or pleural effusion. Some patients undergo unnecessary thoracentesis performed in the absence of an imaging study, resulting in iatrogenic visceral organ injury and death [7]. Should the diagnosis be suspected, ultrasonography or a barium study should be performed. In our case, the abdominal ultrasound showed only an abnormally high liver. This, however, was enough to prompt the performance of a barium study, which clearly demonstrated the diaphragmatic hernia.

Despite the severity of the initial respiratory compromise, the overall survival and outcome of neonates with this association appear to be excellent once the hernia has been repaired, perhaps because the intrathoracic herniation is discovered relatively soon after birth. This does not allow time for severe lung hypoplasia that usually complicates a congenital diaphragmatic hernia if it is not diagnosed early [8]. Therefore, early diagnosis of a diaphragmatic hernia after GBS pneumonia and sepsis is vital in the prevention of undesirable complications.

To summarize, the association of GBS pneumonia and sepsis with delayed presentation of a diaphragmatic hernia typically involves near-term male neonates who have unexpected respiratory deterioration after initial antibiotic treatment. Because of potentially confusing radiologic findings, further imaging studies are needed to confirm or exclude the diagnosis, as well as to avoid potentially dangerous diagnostic studies such as thoracentesis. Though relatively rare, this is truly a disorder for which early diagnosis and surgery lead to an excellent outcome. It’s therefore important for clinicians to have a high index of suspicion for this entity.

**REFERENCES**

新生兒感染 B 型鏈球菌肺炎後表現的延遲性右側橫膈膜疝氣：病例報告

黃士傑¹ 施焄鏻¹,² 劉育朋¹,³ 楊斐適¹,⁴

台北馬偕紀念醫院 放射線科¹
台北醫學大學 放射線診斷科²
馬偕醫護管理專科學校³
元培科技大學 放射技術系⁴

本篇病例報告是關於一位足月的男嬰，在罹患 B 型鏈球菌肺炎感染並接受治療之後仍然表現有呼吸窘迫的症狀，腹部超音波只發現肝臟位置偏高，而後經由上消化道鋇劑攝影確認有合併發生延遲性右側橫膈膜疝氣。造成此關聯性的確切機制尚未完全清楚，然而許多患者在胸部 X 光影像上的表現時常與肋膜積水或其他肺部病灶類似，容易造成臨床診斷上的延遲甚至誤判，若因此讓病患接受不必要的肋膜積水引流甚至可能造成腹腔臟器的損傷。唯有提高對此關聯性的警覺性，方能增加診斷的正確性。