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■ Case report ■

Decreased heart sound in a healthy newborn: Spontaneous multiseptated cystic pneumomediastinum with delayed respiratory distress

Young June Choe, M.D., Eun Sun Kim, M.D., Ee-Kyung Kim, M.D., Han-Suk Kim, M.D.
Jung-Eun Chun, M.D.*, Woo Sun Kim, M.D.*, In-One Kim, M.D.* and Jung-Hwan Choi, M.D.

Department of Pediatrics, Department of Radiology*
Seoul National University College of Medicine, Seoul, Korea

= Abstract =

Spontaneous pneumomediastinum in the absence of predisposing risk factors has been rarely observed in full-term neonates. A 3-day-old neonate, delivered vaginally at term without any perinatal complications or signs of respiratory difficulty, was referred to the Seoul National University Children's Hospital because of reduced heart sound detected during routine neonatal examination. Chest computed tomography (CT) showed air collection in the anterior mediastinum. The baby developed respiratory distress on the fourth day and required supplemental oxygen. On the seventh day, there was no sign of respiratory difficulty, and x-ray examination showed no demonstrable pneumomediastinum. Hence, careful neonatal physical examination is essential during the postnatal assessment of newborns, and spontaneous pneumomediastinum should be considered when a healthy newborn presents with reduced heart sound. (Korean J Pediatr 2010;53:244-247)

Key Words : Spontaneous pneumomediastinum, Term infant, Chest auscultation

Introduction

Spontaneous pneumomediastinum is a rare cause of respiratory distress during the neonatal period. Pneumomediastinum that occurs during this period is mostly associated with assisted ventilation, birth trauma, meconium aspiration, or prematurity[1]. We report the occurrence of spontaneous pneumomediastinum in a healthy newborn in the absence of any known predisposing factors; this condition manifested as decreased heart sounds during routine neonatal examination.

Case report

A 3,530-gm male neonate was born by spontaneous vaginal delivery at 40 weeks gestation to a 30 years old gravida 1 para 1 woman at an obstetric clinic. The prenatal course was unremarkable, and there was no maternal fever or evidence of chorioamnionitis or oligohydramnios. The duration of labor was 8 hours, and the membrane was ruptured just prior to delivery. There was no meconium-stained amniotic fluid, and Apgar scores were 8 and 9 at 1 and 5 minutes, respectively. The baby did not require any postnatal resuscitation. After delivery, the baby was active, and showed no sign of respiratory distress. The baby underwent routine newborn care, was fed with breast milk, and had passed meconium without any problem. At 3 days old, a pediatrician at the obstetric clinic noted decreased heart sounds upon chest auscultation during routine physical examination. The baby did not show any sign of respiratory distress at that time but was referred to the pediatric cardiologist's outpatient clinic at Seoul National University Children's Hospital. The cardiologist decided to admit the baby to the neonatal intensive care unit for further evaluation and management.

The neonate was active at admission, and the physical examination revealed the following: heart rate, 138 beats/min; blood pressure, 75/54 mm Hg; respiratory rate, 50 breaths/min, body temperature, 37.7℃. Breath sounds were

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Address for correspondence : Ee-Kyung Kim, M.D.
Department of Pediatrics, Seoul National University Children's Hospital
28 Yongon-dong, Jongno-gu, Seoul 110-744, Korea
Tel : +82.2-2072-3628, Fax : +82.2-2072-0590
E-mail: kimek@snu.ac.kr

not decreased, and there was no chest retraction or nasal flaring. Heart sounds were almost inaudible at any part of the chest or back of his body. Physical examination was otherwise unremarkable.

The findings of capillary blood gas measurement during inhalation of room air were as follows: pH, 7.363, $PaCO_2$; 32.9 mmHg; and PaO_2, 33 mmHg. Complete blood cell counts and serum biochemistry profiles, including cardiac enzyme assay findings, were within normal limits. Chest x-rays obtained on admission revealed the presence of a large quantity of air in the mediastinum, causing elevation of the thymus with multiple bullous change in the anterior mid-chest (Fig. 1). Echocardiography performed to evaluate heart function revealed an almost invisible heart shadow in the parasternal view due to the large, bullous air-filled lesion in the anterior portion of the left ventricle. The subcostal and suprasternal views showed normal heart function without any intracardiac anomaly. In order to investigate the occurrence of genitourinary tract anomalies, which are frequently reported to be associated with neonatal pneumomediastinum, abdominal ultrasonography was performed, but this revealed no congenital malformation. Because the baby did not show any signs of lethargy, feeding intolerance, or hemodynamic instability, he was not administered intravenous antibiotics or subjected to fluid management. There was no sign of respiratory difficulty, and the baby did not receive any oxygen support.

On the second day of admission, the 4-day-old baby showed mild tachypnea in the absence of subcostal retraction, nasal flaring, moaning sounds, and CO_2 retention on capillary blood gas analysis. Follow-up chest x-rays showed no significant change as compared to 1 day earlier. Because the respiratory difficulty persisted unexpectedly, chest computed tomography (CT) was performed (Fig. 2). The images revealed air collection at the anterior mediastinum, splitting the lower portion of the thymus. Pulse oxymeter readings demonstrated oxygen saturation to be below 95%; therefore, oxygen was applied via nasal cannulae over the next 3 days. There was no evidence of subcutaneous emphysema, pneumothorax, or cardiovascular compromise. Chest x-rays obtained at 5 days of age showed a decrease in the size of the pneumomediastinum. The pulse oxymeter readings showed O_2 saturation to be

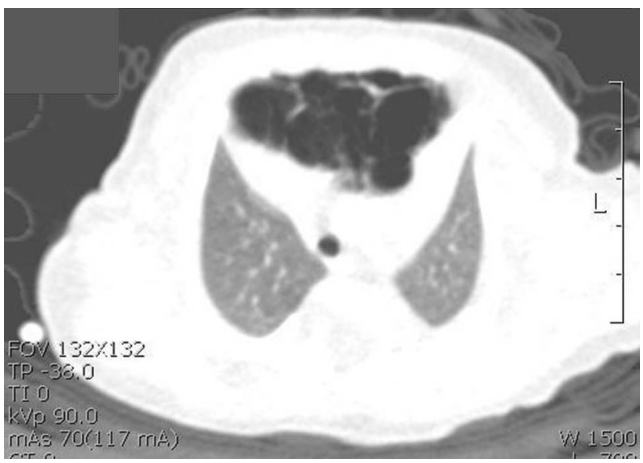

Fig. 2. Chest computed tomography (CT) shows air collection at the supposed anterior mediastinum, splitting the lower portion of the thymus. Multiseptated cysts filled with air suggested pneumomediastinum.

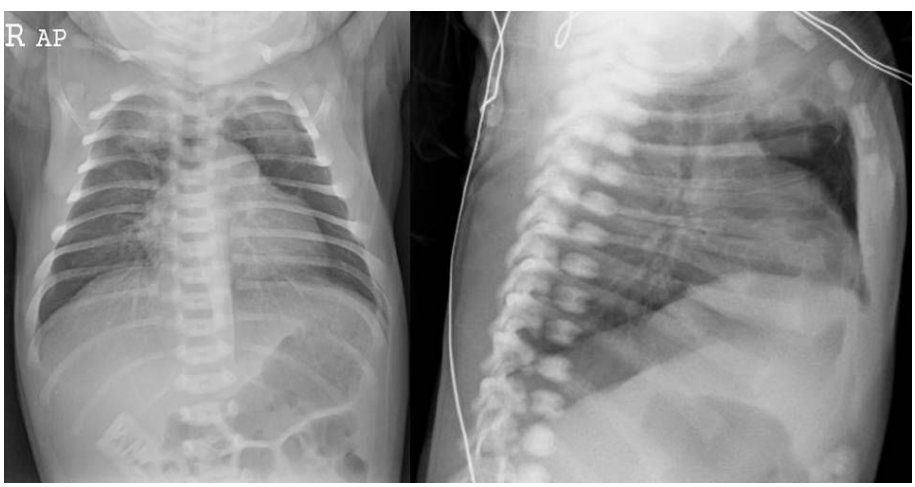

Fig. 1. Chest anteroposterior and lateral view x-ray scan on admission demonstrate multiple bullous changes in the anterior mid-chest and an enlarged thymus.

above 99% without ventilation, and the baby showed no sign of respiratory difficulty. Neither assisted ventilation nor insertion of mediastinal drains was necessary. Brain and abdominal sonograms showed no sign of hemorrhage and no evidence of congenital malformation. At 7 days old, there was no respiratory difficulty, and x-rays revealed that the air leak into the mediastinum had decreased. At the age of 9 days, the baby was discharged and follow-up x-rays obtained at the outpatient clinic showed no demonstrable pneumomediastinum.

Discussion

Pneumomediastinum is a rare clinical condition characterized by the collection of air or gas in the mediastinal space[1]. The most common cause of neonatal pneumomediastinum is barotraumas, which usually occurs secondary to positive pressure ventilation and is most frequently seen in preterm infants[1]. Mechanically ventilated patients who require high peak inspiratory pressure are at risk of developing pneumomediastinum secondary to barotrauma[2]. Pneumomediastinum that does occur as a consequence of chest trauma, endotracheal or esophageal procedures, mechanical ventilation, or thoracic surgery is termed spontaneous pneumomediastinum. There are reports of newborns developing spontaneous pneumomediastinum in the absence of any known predisposing factors, similar to our case[3, 4].

It is postulated that pneumomediastinum may develop spontaneously due to forceful inspiratory effort and non-homogeneity of ventilation, resulting in alveolar over-distention and rupture with eventual dissemination of air to the hilar space[5]. As air accumulates in the mediastinum, few symptoms are observed until increased mediastinal pressure causes cardiovascular or respiratory compromise by decreasing venous return to the heart or by compressing major bronchi[6]. Many of the clinical signs of pneumomediastinum in neonates, such as tachypnea, lethargy, and poor feeding, are non-specific and unreliable[7]. In some cases, heart sounds may be decreased, as observed in our patient. However, not many reports describe decreased heart sounds as the sole symptom of neonatal pneumomediastinum[8]. The decreased heart sound observed in our patient may have resulted due to a pneumomediastinum that formed a multiseptated lesion within the anterior mediastinal space.

A diagnosis can usually be made using x-rays, CT, and ultrasound. Approximately half of the cases of pneumomediastinum go undetected when only the anteroposterior view is considered. One study suggested that x-ray alone detected only 30% of the spontaneous pneumomediastinum cases[9]. Another study suggested that chest CT was required for diagnosis[10]. The x-ray findings in our patient showed that the thymic lobes had a crescent-like configuration, resembling a spinnaker sail as it is lifted by air, and were separated from the mediastinal structures. For the differential diagnosis of an underlying congenital mediastinal cyst or air filling within a lymphangioma, chest CT can provide superior diagnostic information as compared to simple x-rays[11, 12]. The chest CT findings of pneumomediastinum in neonates show a multiseptated lesion indicating the involvement of the fascia of the mediastinal structures that connect to the thymus[4, 11]. The chest CT finding in our patient supports that neonatal pneumomediastinum tends to loculate and has a lobulated internal septum owing to the fact that the involved fascia of neonates is firm and strong and prevents further dissection of the mediastinal tissue, thereby preventing development of subcutaneous emphysema[5, 10].

There are reports of a frequent association between pneumomediastinum and renal malformation in newborn infants; therefore, congenital malformation should also be considered in babies with spontaneous pneumothorax or pneumomediastinum[13, 14]. Abdominal ultrasonography of our patient revealed no congenital malformation of kidneys or any other intra-abdominal organs.

Pneumomediastinum is usually asymptomatic and resolves spontaneously. Therefore, invasive approaches to drain the trapped mediastinal air should not be performed unless established cardiovascular compromise or bronchial compression is noted clinically[6]. Some reports have stated that surgery was required because of progressive respiratory distress and failed supportive care[10]; however, because of their anatomical disadvantages, attempts to drain air from mediastinal structures are often unsuccessful, despite needle or tube drainage being performed in most cases. Our study has also demonstrated that this type of invasive procedure is not always necessary and that close monitoring and adequate oxygen support are needed for the management of pneumomediastinum in neonates. As with our patient, it is important to detect abnormal physical findings at the initial stages because respiratory difficulty may develop later in the course of neonatal pneumomediastinum.

We have described a case of spontaneous pneumomediastinum in a full-term neonate detected by decreased heart sound during auscultation. Careful physical examination is essential in postnatal assessment of newborns, and spontaneous pneumomediastinum should be suspected when a healthy newborn presents with decreased heart sounds.

요 약

자발성 종격동 기흉: 작게 청진된 심음을 주소로 내원한 신생아

*서울대학교 의과대학 소아과학교실, 영상의학교실**

최영준 · 김은선 · 김이경 · 김한석
천정은* · 김우선* · 김인원* · 최중환

자발성 종격동 기흉은 신생아기에 발생하는 호흡곤란의 드문 원인 중의 하나이며 대부분의 증례에서는 인공호흡, 출산손상, 태변흡입 등이 선행하는 경우가 많으며, 또한 대다수가 미숙아로 알려져있다. 저자들은 신생아 진찰 중 심음이 적게 들리는 소견으로 발견되었던, 위와 같은 위험인자가 없는 건강한 만삭아에서 발생한 자발성 종격동 기흉 1예를 경험하였기에 이를 보고하는 바이다.

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