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Case Reports

Inability to View the Heart Through the Subxiphoid Echocardiographic Window: A Harbinger of Disaster

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SUMMARY. Two case reports of critically ill neonates, one with pneumomediastinum, the other with pneumopericardium, illustrate how the inability to view the heart through the subxiphoid echocardiographic window occurs only in pneumopericardium. This echocardiographic nonfinding should alert the echocardiographer and neonatal team of impending pericardial tamponade.

KEY WORDS: Echocardiography — Pneumomediastinum — Pneumopericardium

Neonates with severe hyaline membrane disease, sepsis, or meconium aspiration syndrome are likely to develop intrathoracic air leaks secondary to positive pressure ventilation [2, 5]. The radiographic differentiation between pneumomediastinum and pneumopericardium can be particularly difficult in some cases. The following two cases illustrate how echocardiography, often used to evaluate these infants for cardiac defects, may provide clues to the location of the intrathoracic air. Furthermore, the second case underlines the need for increased suspicion of pneumopericardium and impending disaster when the heart cannot be visualized through the subxiphoid window.

Case Reports

Case 1

A 27-week gestation male infant born prematurely due to a placental abruption presented with severe respiratory distress syndrome requiring ventilatory support with very high pressures. He rapidly developed pulmonary interstitial emphysema and bilateral pneumothoraces. An x-ray following bilateral chest tube placement showed not only resolution of the pneumothoraces, but also the development of a thin radiolucency along the left cardiac border with extension into the superior mediastinum (Fig. 1). This was felt to be consistent with pneumomediastinum. In light of the infant's progressively worsening cardiorespiratory status, an echocardiogram was performed at approximately 12 h of age to evaluate for possible confounding congenital heart disease. An echocardiogram performed after appearance of the pneumomediastinum showed clear visualization of the heart, possible only from the subxiphoid view. Parasternal and apical views were not obtainable because of air artifact. A very small pericardial effusion was present with no evidence of deformation of the cardiac cavities suggestive of cardiac tamponade, and no structural abnormalities were detected otherwise. Follow-up x-rays at 24 h of age showed worsening pulmonary interstitial emphysema, but no enlargement of the pneumomediastinum and no change in the cardiac silhouette. The patient died a few hours later from his severe respiratory distress syndrome.

Case 2

A 32-week gestation male infant with Group B Streptococcal sepsis required intubation at birth and subsequent ventilatory support with very high pressure. On the second day of life, he was noted to have an intermittent murmur, palmar pulses, and a widening of his pulse pressure. An echocardiogram demonstrated bidirectional flow through a patent ductus arteriosus. Standard parasternal, apical, and subxiphoid views all gave clear unimpeded cardiac imaging. The patient was then treated with one dose of indomethacin. The clinical signs of a patent ductus arteriosus resolved, but the infant's cardiorespiratory status continued to deteriorate. An echocardiogram was therefore attempted to confirm ductal closure. At that time, the heart could not be visualized from any echocardiographic window including the subxiphoid view. Although a chest x-ray performed a few hours prior to the echocardiogram showed no evidence of air leaks, a chest x-ray obtained immediately following the echocardiogram demonstrated a large pneumopericardium (Fig. 2). At that time, the patient had a stable blood pressure and heart rate with a normal pulse pressure. However, the pulse pressure be-
Fig. 1. Pneumomediastinum in case 1: Radiolucency extends to the diaphragmatic–pericardial reflection, but does not interrupt it.

Fig. 2. Pneumopericardium in case 2: At the time of this radiograph, the patient had clinical evidence of pericardial tamponade. Note that the cardiac interface with the diaphragm is interrupted.

Pneumomediastinum and pneumopericardium are complications of many of the same processes, including positive pressure ventilation, trauma, and asthma exacerbations. Considering the differing clinical significance and therapeutic management, it is important to know which of these two types of air leaks is present. A pneumomediastinum requires close observation for signs of progression to a pneumothorax, but requires no intervention [7]. A pneumopericardium in children, especially neonates, however, is well known for producing cardiac tamponade [2, 3]. Intervention is therefore urgently needed in children and in some adults with pneumopericardium, making correct differentiation of the two entities crucial [5].

Radiographic evaluation for a pneumopericardium versus a pneumomediastinum is well described and relies largely upon two observations. Air within the pericardial sac moves with repositioning of the patient, but is limited by reflection of the pericardium on the great vessels. It often dissect superiorly above the level of the pericardial reflection, especially in a seated patient, although not always seen in the supine patient. In the critical care setting, a supine AP chest x-ray is the most common study performed for assessing intrathoracic air leaks. Repositioning may not be possible, especially in neonates. The usual guidelines above may not clearly differentiate between pneumomediastinum and pneumopericardium. Chest x-ray findings of the halo sign or of a falling cardiothoracic ratio in tandem with deterioration of hemodynamic status is suggestive of a pneumopericardium [4]. However, since both of these findings are consistent with a large volume of air in the pericardial sac, by that point, there are usually obvious coexistent clinical findings of an evolving cardiac tamponade, such as a decrease in pulse pressure, cyanosis, and decreasing blood pressure. Additionally, since the same etiologies exist for both a pneumopericardium and a pneumomediastinum, both could easily be present within the same patient. The appli-