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Iatrogenic pneumopericardium after tube thoracostomy: A case report

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ABSTRACT

INTRODUCTION: Pneumopericardium, the presence of air within the pericardial space, is a rare occurrence which usually follows positive pressure ventilation in infants, or blunt and penetrating thoracoabdominal injuries in adults. The occurrence of iatrogenic pneumopericardium following tube thoracostomy is extremely rare.

PRESENTATION OF CASE: We present a rare case of iatrogenic pneumopericardium in a 1 year and 7 months old female child for whom a left side tube thoracostomy was done using nasogastric tube for an indication of left empyema thoracis. Later, she developed progressively worsening shortness of breath and imaging revealed iatrogenic pneumopericardium. She was managed conservatively and discharged home in good condition.

DISCUSSION: Iatrogenic pneumopericardium can have a range of presentations from being asymptomatic to features of cardiac tamponade. Patient management depends on the presence of tamponade effect and age of the patient. Infants tend to develop cardiac tamponade earlier urging surgical intervention but selected patients can be managed conservatively.

CONCLUSION: Iatrogenic pneumopericardium is a rare event but it might lead to death if not diagnosed and treated promptly. Although the tendency to develop tension pneumopericardium urging surgical intervention is high in pediatric patients, our patient has improved well with conservative management. While reporting of complications is not popular, this represents an opportunity to advance the safety during chest drain insertion.

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1. Introduction

Pneumopericardium, the presence of air within the pericardial space, is a rare consequence of blunt, penetrating and iatrogenic injury [1]. It can also occur following pericarditis by gas forming organisms and through a connection with air containing adjacent organs such as the esophagus and the stomach [2]. It can be classified into simple and tension pneumopericardium [1].

Usually, simple pneumopericardium is asymptomatic while tension pneumopericardium may present with circulatory collapse due to cardiac tamponade [1].

Chest radiography typically shows a small heart, partially or completely surrounded by air, which is contained within a sharply defined halo of pericardium (the halo sign) [3,4]. Chest CT scan and transthoracic or transesophageal echocardiography, are also helpful in visualizing signs of pericardial tamponade or the presence of pericardial air [5–7].

The immediate treatment of tension pneumopericardium is decompression of the pericardial air by insertion of a large-bore needle or intravenous catheter [8]. *This case report is reported in line with the SCARE 2018 criteria* [9].

2. Case presentation

One year and seven months old female child presented with a complaint of intermittent dry cough of 3 weeks' duration associated with high grade intermittent fever and loss of appetite. She has no contact history with known pulmonary tuberculosis patients. For her above complaints, she was taken to a nearby health center where she was given antibiotics (amoxicillin syrup) for 7 days but showed no improvement. Subsequently, she was referred to our hospital, but her parents preferred to take her home. Two weeks later she presented to our institute with worsening of cough and shortness of breath. On presentation her vital signs were deranged

Abbreviations: CT, computerized tomography; PICU, Pediatric Intensive care unit; IV, intravenous; PIHCT, Provider initiated HIV counseling & testing; SAM, Severe acute malnutrition; SPHMMC, St. Paul's Hospital Millennium Medical College.

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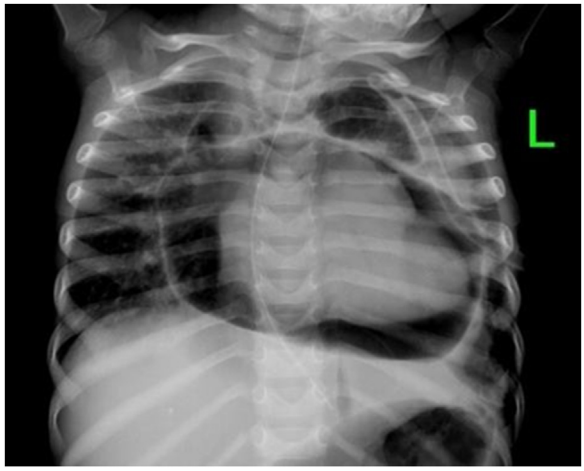

Fig. 1. Chest X-ray showing radiolucency within the pericardium (Pneumopericardium), left side pneumothorax and a misplaced chest tube.

and oxygen saturation was 70% with atmospheric air. She was in respiratory distress with grunting, intercostal and subcostal retraction. She also had absent air entry on her left posterior lower two-third of the lung field. She was also cachexic with evidence of severe acute malnutrition. Otherwise, she has no history of drug allergy, self or family history of relevant medical or surgical illness.

Her basic laboratory examinations revealed leukocytosis of 26,500 with left shift. Sputum gene x-pert for tuberculosis was negative and chest x-ray showed homogenous opacity on the left side.

With these findings, the surgeon tapped her left chest which revealed frank pus. With an impression of post pneumonic empyema thoracis, chest tube was inserted at the left triangle of safety using a feeding (nasogastric) tube due to lack of the proper thoracic tube. Upon chest drain insertion, about 100 ml frank pus was drained and her respiratory distress improved. Pleural fluid analysis revealed an increased white cell count of 16,000 with neutrophil of 77.7%. Post procedure, she was transferred to an intensive care unit and put on oxygen support as well as wide spectrum antibiotics (ceftriaxone and metronidazole). On the 2nd post procedure day after chest tube insertion, she developed a worsening of shortness of breath. Together with this, she became tachycardic (120–140 beats/minute) with muffled and distant heart sounds. For these new findings, a control chest x-ray was taken (Fig. 1) and it showed pneumopericardium with a classical "halo sign". In addition to the pneumopericardium, there was also left side pneumothorax, and a misplaced chest tube. Otherwise, the cardiac functions were reserved upon echocardiographic evaluation.

With the diagnosis of iatrogenic simple pneumopericardium with pneumothorax, the surgical team decided to manipulate the chest drain and observe her closely with conservative management. She was put on facemask oxygen, intravenous (IV) antibiotics, nutritional treatment, and analgesics. In subsequent days following the procedure, the pneumopericardium decreased and the chest drain output reduced remarkably (Figs. 2 and 3). The left side chest tube was removed on the 10th day after insertion.

Subsequently, the patient showed a remarkable improvement and was discharged from the hospital in a stable condition.

3. Discussion

Pneumopericardium was first described by Bricheteau in 1844 [10–12]. It was initially assumed that air in the pericardium was a finding causing no harm. If injected slowly the pericardium can

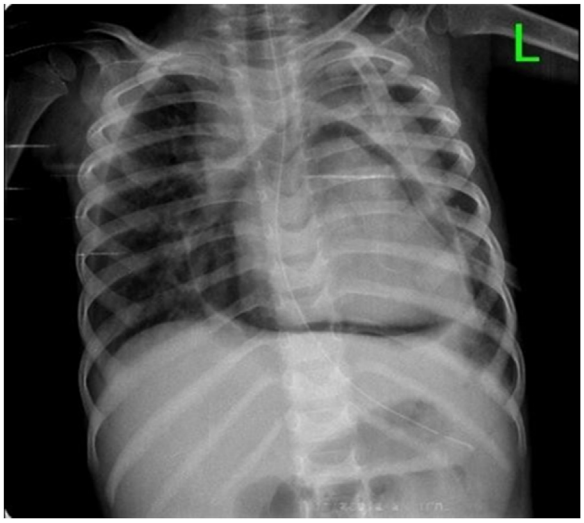

Fig. 2. Chest X-ray taken 2 days later showing relatively decreased air within the pericardium.

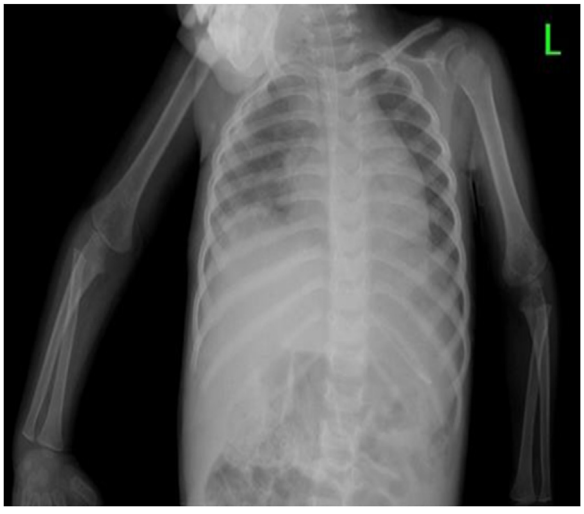

Fig. 3. Final CXR up on discharge of the patient showing resolved pneumopericardium.

accommodate about 500 cc air without cardiac tamponade effect, which makes the rate of instillation a determinant factor [10]. This is a possible explanation as to why our patient developed severe respiratory distress and tachycardia 2 days after the insertion of the chest tube. Macro perforation of the pericardium with communication to the adjacent structures, pleuro-pericardial connection or pulmonary volutrauma with tracking alveolar air into the pericardium can result in pneumopericardium. In our case, pleuro-pericardial connection with pneumothorax is the possible mechanism for the development of pneumopericardium [13–15].

Up to 37% of simple pneumopericardium events can progress to form tension pneumopericardium and mortality associated with tension pneumopericardium can be as high as 57% [8,10,11]. Classic patient presentation with features of cardiac tamponade is rare and include: attenuation of heart sounds, elevated central venous pressure, hypotension, tachycardia and pulsus paradoxus [10,13,16,17]. Percussion may reveal "shifting precordial tympany" in which the precordial hyper resonance shifts as the patient changes position [17]. These clinical signs may be difficult to elicit in emergency situations especially in pediatric patients like our case [14,17].

Management of pneumopericardium depends on the presence of tamponade effect and age of the patient. Adults with no sign of cardiac tamponade can be managed with a conservative approach. But infants have a higher mortality rate up to 40% due to early development of cardiac tamponade. For this reason, the conservative approach is not advised in this age group [6]. In our patient, the absence of echocardiographic evidence of tamponade, the severe malnutrition she had and the already infected pleural cavity that could increase her postoperative complication has led to the decision for conservative non-surgical approach.

Although experiences with conservative management of pneumopericardium in infants is limited and those reported were ending up with surgical intervention, our patient's outcome shows conservative management can be practiced with meticulous patient follow up. Iatrogenic pneumopericardium following chest tube insertion is an extremely rare complication and commonly occurs in infants [18]. Extra caution during chest tube insertion, especially when using alternatives other than thoracic tube is the cornerstone preventive measure.

Upon subsequent follow-up, our patient has both clinical and radiological improvement and her family is also happy with her treatment.

4. Conclusion

Iatrogenic pneumopericardium following tube thoracostomy is a very rare event and proper positioning of the drain during placement is a crucial preventive measure. Delayed diagnosis is associated with increased morbidity and mortality. The tendency to develop tension pneumopericardium urging surgical intervention is high in pediatric patients. But our patient has improved well with conservative management demonestrating that conservative approach is a feasible alternative in selected patients. While reporting of complications is not popular, this represents an opportunity to advance safety during chest drain insertion.

Declaration of Competing Interest

All authors declare that they have no conflict of interest

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Ethical approval

Ethical Clearance was obtained from the Institutional Research and Ethics Review Committee (IRB) of SPHMMC for the publication of the case report and accompanying images.

Consent

Written informed consent was obtained from the patient's family for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

1. Esubalew Taddese Mindaye, MD

Conceived and conducted the study, did literature search and Critical revision of the manuscript, primarily involved in the management of the case.

2. Abraham Arayia, MD

Conducted over all supervision and critical revision of the manuscript.

3. Tesfaye H. Tufa, MD

Conducted over all supervision and critical revision of the manuscript.

4. Mahteme Bekele, MD, MPH

Conducted over all supervision and critical revision of the manuscript.

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Esubalew Taddese Mindaye, MD.

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