Pneumopericardium

Pathak MR[1], Shakya D[2]

Abstract

Pneumopericardium may be defined as the presence of air within pericardial cavity which results due to spontaneous or iatrogenic cause. It is rare but life threatening entity, commonly caused by respiratory distress syndrome and vigorous resuscitation, in the paediatric population. Although, pneumopericardium is often asymptomatic, it may cause chest pain, dyspnoea and subcutaneous emphysema. The course of pneumopericardium is usually benign and self-limited. Treatment is crucial in tension pneumopericardium, a complication of pneumopericardium. Here, we report a case of pneumopericardium in a nine month old male child after vigorous resuscitation and intubation for respiratory distress syndrome.

Key words: Pneumopericardium, sub cutaneous emphysema, Hamman's sign.

[1]Dr. Meen Raj Pathak, MBBS, DCH, MD, Consultant Paediatrician, Nepal Police Hospital and Intensivist, International Friendship Children's Hospital (IFCH), [2]Dr. Disuja Shakya, MBBS, MD, Registrar, IFCH.

Address for correspondence:
Dr. Meen Raj Pathak
E-mail: mmha_23@yahoo.com

How to cite
Pathak M R, Shakya D. Pneumopericardium. J Nepal Paediatr Soc 2014;34(2):163-165.

doi: http://dx.doi.org/10.3126/jnps.v34i2.11152

Introduction

Pneumopericardium is the collection of air or gas within pericardial cavity and results due to consequence of a blunt or penetrating injury to the chest or iatrogenic cause. Spontaneous pneumopericardium is a very rare condition. Respiratory distress syndrome combined or not with mechanical positive pressure ventilation is most common cause in infants[1], or after vigorous resuscitation. pneumopericardium characteristically presents with Hamman's sign. The diagnosis of Pneumopericardium can be made by conventional chest radiographs or CT chest, with the heart being partially or completely surrounded by air, with the pericardium sharply outlined by air density on either side. Rapid diagnosis and adequate treatment for symptomatic or large pneumopericardium is crucial. Asymptomatic patient should be given supportive treatment and continuous monitoring with vitals and chest X ray should be done.

The Case

A nine months old male child was admitted in International Friendship Children's Hospital (IFCH), in April 2014, with chief complaints of noisy breathing, cough and fever since the past 10 days. Despite medical treatment at Chitwan Medical College his symptoms did not improve, hence referred to IFCH. The mother gave history of noisy breathing on and off and dry cough since birth. The fever was high grade, intermittent type, not associated with chills and rigor. No history of vomiting, rash, loose motion, loss of consciousness or abnormal movement of body. With the same complaints, the child also had been admitted twice in the hospital and discharged with complete recovery three months back.

His birth history was uneventful, was immunized as per EPI schedule and his developmental milestones being appropriate for age. Family history was non contributory with no history of any familial/hereditary disease or consangious marriage. There was no clinical evidence of other infectious disease in family.

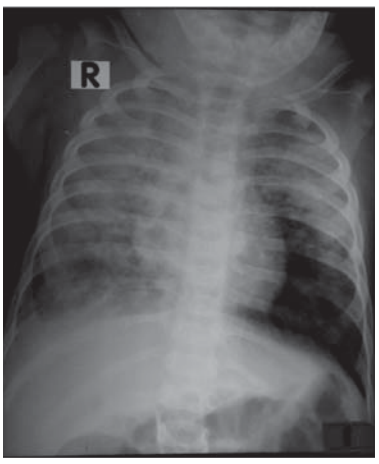

Fig 1: Chest X ray showing bilateral lung infiltrates (during admission)

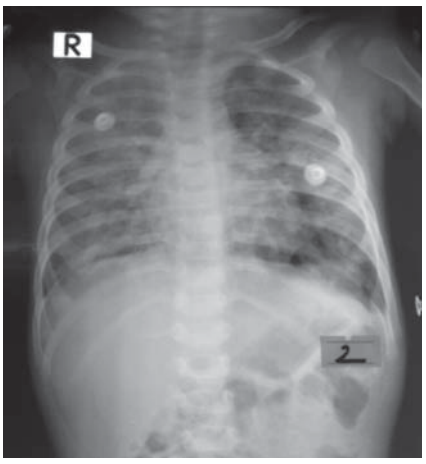

Fig 2: Chest X ray showing persistent bilateral lung infiltrates (Day-3)

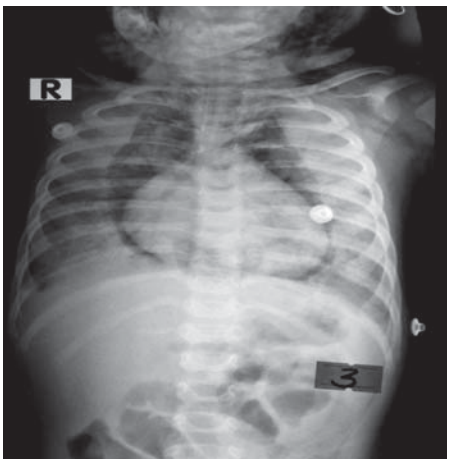

Fig 3: Chest X ray showing halo of air around the heart

Positive clinical examination revealed sick looking child with tachycardia, tachypnoea, pyrexia with oxygen saturation of 66% in room air. Chest examination revealed mild sub costal retraction with bilateral equal chest movement, normal on palpation and percussion. On auscultation, he had bilateral wheezes and crepitations. He had enlarged liver of 4 cm below the right sub costal margin with blunt edge and non tender upper border of hepatic dullness and the remainder of the examinations were unremarkable.

His blood parameters and ABG were within normal limit. The chest X-ray showed bilateral chest infiltrates (Fig.1). ECG showed sinus tachycardia with normal echocardiography. Along with antibiotics Meropenem and Vancomycin, injection Hydrocortisone, oxygen supplementation via head box, salbutamol nebulisation and intravenous fluid therapy were instituted.

On third day of admission, his condition worsened. He was tachypnic, tachycardic and saturation was not maintained, inspite of oxygen, 10L/min via head box. Chest X ray was done, which was worse than before (Fig 2). CT chest couldn't be done due to poor economic status.

He was then intubated and put on mechanical ventilator for respiratory failure. The vitals were stable and saturation was maintained after intubation. The child was asymptomatic. Post intubation Chest X ray showed halo of air around the heart (Fig 3). There was no clinical evidence of cardiac air tamponade. Positive End Expiratory Pressure (PEEP) was immediately decreased to 3. Vitals closely monitored and planned for cardiac decompression (pericardiocentesis). But, before any active intervention could be done, the child suddenly deteriorated. Despite our full effort he went into cardiac arrest and expired.

Discussion

Pneumopericardium is a rare medical condition with high morbidity and mortality, first described by Bricheteau in 1844[2]. In adults, pneumopericardium results from trauma[3] or from physical exertion[4]. In infants, most common cause being respiratory distress syndrome combined with mechanical ventilation. Mechanically ventilated patients are particularly at risk for tension pneumopericardium (TPPC) secondary to barotrauma[5].

Other causes could be infectious pericarditis with gas-producing organisms, fistula between the pericardium and an adjacent air-containing organ (i.e. stomach or esophagus), foreign body aspiration, amebic abscess of the liver, severe cough, bronchial asthma[6], endotracheal intubation, sternal bone marrow puncture, thoracic surgery, thoracocentesis and pericardiocentesis[7], central venous line[8], endoscopic procedures, and laparoscopy.

The mechanism by which pneumopericardium occurs was demonstrated by Macklin in animal studies[9]. An increased intrathoracic pressure is the most likely cause that leads to air enters the pericardial sac along the venous sheaths, where the collagenous support of the pericardial reflections is weaker and results in pneumopericardium.

The clinical signs of pneumopericardium range from asymptomatic to the full picture of cardiac tamponade. The clinical diagnosis is based on the symptom triad of dyspnoea, precordial chest pain and subcutaneous emphysema in older children and adults[4]. Other signs include cyanosis, hypotension, bradycardia or tachycardia, and pulsus paradoxus. It is also based on muffled heart sound with Hamman's crunch of pneumomediastinum[10].

Usually pneumopericardium is self-limiting. Asymptomatic patients with small pneumopericardium should be observed closely with chest radiograph, treatment directed towards the underlying disease. They recover spontaneously within one or two weeks. Treatment is crucial in symptomatic patient with tamponade, termed tension pneumopericardium. Tension pneumopericardium is rare but lethal complication of pneumopericardium. It should be treated emergently by pericardiocentesis[11]. The Beck triad of muffled heart sounds, hypotension, and jugular venous distention, strongly suggests tamponade. The most ominous sign of hemodynamic collapse is pulsus paradoxus (exaggerated fall in systolic blood pressure of 10 mm Hg or more during inspiration).

64-slice helical CT is more reliable than CXRs for diagnosis[4] but chest X-ray remains the most conventional method. In pneumopericardium, the heart is partially or completely surrounded by air, with the pericardium sharply outlined by air density on either side. In tension pneumopericardium, substantial decrease in the size of the cardiac silhouette may be observed on radiographs, the small heart sign[12].

Conclusion

Pneumopericardium is rare but life threatening entity. It could be missed on clinical examination. CT scan is most conclusive but chest X-ray remains the most conventional method for the diagnosis of pneumopericardium. Continuous monitoring and invasive drainage of pneumopericardium should be approachable.

References

1. Kabinoff GS, Gitler B. Pneumopericardium in a patient with AIDS. *Tex Heart Inst J* 2002;29:51–3.
2. Cummings RG, Wesly RL, Adams DH, Lowe JE. Pneumopericardium resulting in cardiac tamponade. *Ann Thorac Surg* 1984;37:511-518
3. Chopra V, Garg N, Mrigpuri P. Spontaneous pneumopericardium an unusual complication in a patient of HIV and pulmonary tuberculosis. *Lung India* 2013;30(2):148–150.
4. Okada M, Adachi H, Shibuya Y, Ishikawa S, Hamabe Y. Diagnosis and treatment of patients with spontaneous pneumomediastinum. *Resp Invest* 2014;52:36-40.
5. Karadzic R, Antovic A, Ilic G. Peumopericardium: A possible rare cause of neonatal death. *Facta universitatis* 3007;14(2): 98-100.
6. Agarwal MP, Giri s, Sharma V. Spontaneous pneumopericardium in acute asthma. *Int J Emerg Med* 2010;3(2):141
7. Choi WH, Hwang YM, Seung KB. Pneumopericardium as a Complication of Pericardiocentesis. *Korean Circ J* 2011;41(5):280-82
8. Giuliani S, Franklin A, Pierce J. Massive subcutaneous emphysema, pneumomediastinum, and pneumopericardium in children. *J Pediatric Surg* 2010; 45(3):647-9
9. Ganie FA, Lone HU, Lone GN, Singh S, et al. Traumatic pneumomediastinum: A risk factor for the development of pneumopericardium. *Int J Students' Res* 2013;3:1
10. Ameh V, Jenner R, Jilani N, Bradbury A. Spontaneous pneumopericardium, pneumomediastinum and subcutaneous emphysema: unusual complications of asthma in a 2-year-old boy. *Emerg Med J* 2006;23(6):466–67.
11. Dursun Türkbay. Pneumopericardium in a term infant on nasal continuous positive airway pressure. *Arch Dis Child* Fetal Neonatal Ed. 2007; 92(3): 168.
12. Radiopedia.org [Internet]. Jones J, Radswiki et al. Cardiac Tamponade. [Updated 2013 July, cited 2014 Feb]. Accessed from: http://radiopaedia.org/articles/cardiac-tamponade