

Tension Pneumatocele a Rare Presentation

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Abstract

A 10 months old female baby admitted with diagnosis of tension pneumatocele in right side of hemithorax with collapse right lung. The baby was first managed conservatively, but the condition did not improve. Surgical management was done after one month of admission in hospital, with improvement of baby's symptoms and general conditions. One month later the baby was well and her lung was found expanded completely.

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Introduction

Pulmonary pneumatoceles are thin-walled, air-filled cysts that develop within the lung parenchyma. They can be single emphysematous lesions but are more often multiple, thin-walled, air-filled, cystlike cavities. Most often, they occur as sequelae to acute pneumonia, commonly caused by *Staphylococcus aureus*. Pneumatoceles are generally observed soon after the development of pneumonia but can be observed on the initial chest radiograph.¹

Tension pneumatocele can be defined as expanding air-filled pulmonary cyst, usually of post infectious origin, compressing adjacent area of the lung and resulting in cardiorespiratory compromise.²

Since the 1950s, multiple theories have been proposed as to the exact mechanism of pneumatocele formation; however, the exact mechanism remains controversial.

Carrey suggested that the initial event is inflammation and narrowing of the bronchus, leading to the formation of an endobronchial ball valve.³ Ultimately, this bronchial obstruction leads to distal dilatation of the bronchi and alveoli. In 1951, Conway proposed that a peribronchial abscess forms and subsequently ruptures its contents into the bronchial lumen⁴. This also acts similarly to a ball-valve obstruction in the bronchus and leads to distal dilatation. In 1972, Boisset concluded that pneumatoceles are caused by bronchial inflammation that ruptures the bronchiolar walls and causes the formation of "air corridors". Air dissects down these corridors to the pleura and forms pneumatoceles, a form of subpleural emphysema⁵.

In most circumstances, pneumatoceles are asymptomatic and do not require surgical intervention. Treatment of the underlying pneumonia with antibiotics is the first-line therapy. Close observation in the early stages of the infection and periodic follow-up care until resolution of the pneumatocele is usually adequate treatment. The natural course of a pneumatocele is slow resolution with no further clinical sequelae. Invasive approaches thoracostomy or surgery should only be reserved for patients who develop complications such as pleural effusion, empyema, pulmonary abscess and pneumatoceles⁶.

Case Report

A 10 months old baby girl was suffering from recurrent attack of respiratory distress, fever, dry cough and nasal discharge for one month. Fever was high grade intermittent in nature associated with chill and rigor and relieved by antipyretic. Severe respiratory distress with chest indrawing, dry cough and nasal discharge for same duration. She was diagnosed as a case of pneumonia and treated by local physician but her condition not improved. Local physician noticed air filled space developed in right lung then she was referred to our hospital for better management. On general examination baby was ill looking, dyspnoeic, chest indrawing present, respiratory rate 30 breaths/min, high temperature. On palpation trachea shifted to the left side. Chest expansion diminished on right side. Percussion note was hyper resonant on right side of chest in midclavicular, mid axillary and posterior scapular line. Breath sound diminished on right side in midclavicular, mid axillary and posterior scapular line,

some inspiratory crackles present. On routine investigation leucocytosis with raised ESR, on CXR P/A view (Fig-I) there was a large translucent area involvement of upper, mid and lower zone which devoid of lung margin with septum in right side. Some thin walled cystic cavity with multiple fluid level present in right lower zone. Trachea and mediastinum shifted to left side. Widening of intercostal space are also seen. Blood culture was negative. CT scan of chest shown multiple cystic air filled space of variable size are noted in right lung with compression collapse and consolidation of adjacent lung. Finding were consistent with pneumatocele involving right lung. We first tried to manage the patient medically. The child was treated conservatively with injectable antibiotic, oral bronchodilator, expectorant, antipyretic and nebulization but the baby's condition was not improved. So we planned for operative treatment. After proper evaluation of general condition, operation was performed one and half months after admission. Under general anesthesia with one lung ventilation, chest opened with standard posterolateral thoracotomy incision through right 4th intercostals space. A cystic cavity filled with air, was found occupying nearly whole of the right chest cavity (Fig-II). The cystic cavity was carefully dissected out, after removal of cavity right lung expanded properly (Fig-III), with minimum fistula. After haemostasis chest wall closed in layers keeping two drains one in apical and one in basal position. The tissue sent for histopathological examination and microscopic examination reveals section of cyst wall, composed of granulation tissue and fibrous tissue, it is infiltrated with chronic inflammatory cells and foamy histiocytes, consistent with pneumatocele. On first post operative day, breath sound was present on both side of chest in all the area and chest radiograph showed bronchovascular markings present in right side of chest suggestive of expanded right lung, drain tube collection were minimum. Apical chest tube was removed on 3rd post operative day and basal chest tube removed on 6th post operative day. The baby was discharged from hospital on 8th post operative day with advice of follow up visit after one month with CXR P/A view. After one month the baby's general condition improved with normal CXR finding.



Fig-I : CXR P/A view showing large translucent area involvement of upper, mid and lower zone with devoid of lung margin with septum in right side consistent with pneumatocele.



Fig-II : Thoracotomy through rt 4th intercostal space showing cystic structure occupying whole of rt pleural cavity.

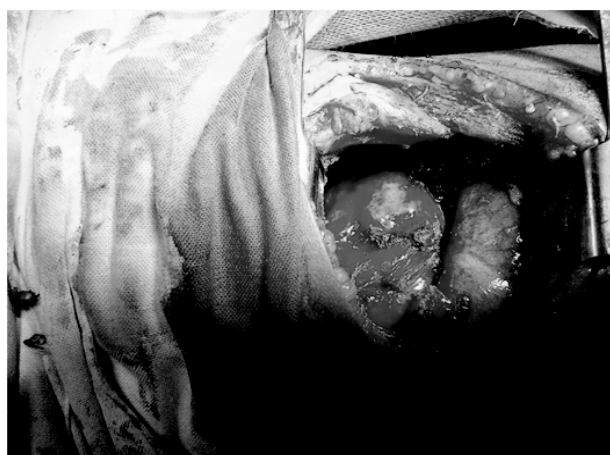


Fig-III : Thoracotomy through rt 4th intercostal space showing fully expanded lung after excision of pneumatocele.

Discussion

Pulmonary pneumatoceles are air collections in the interstitium of the lung. Mostly, they occur as sequelae to acute bacterial pneumonia, reported as *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Proteus mirabilis*, *Escherichia coli* or *Acinetobacter calcoaceticus*. Noninfectious etiologies include hydrocarbon ingestion, trauma, and secondary to positive pressure ventilation⁷. Tension pneumatocele can be defined as expanding air-filled pulmonary cyst, usually of postinfectious origin, compressing adjacent area of the lung and resulting in cardiorespiratory compromise. Most pneumatoceles occur as a complication of pneumonia. They are known to resolve spontaneously over several weeks or months. Rarely, they may result in complications of tension, infection, and rupture which may be life threatening and requires prompt attention. Tension pneumatocele enlarges significantly compressing adjacent lung and mediastinum resulting in cardiovascular collapse². Our baby patient was diagnosed as a case of pneumonia. Most of the cases reported in the literature were infants and children. Apart from the index patient who presented with double tension pneumatoceles at 3 months of age, only one patient reported by Papageorgiou et al. developed clinical and

radiologic features of traumatic pneumatocele on the 42nd day of life⁸. Most of the cases of adult patients reported in the literature had an additional underlying pathology⁹. Our baby patient was infant. Our patient had multiple pneumatoceles, all confined to the right lung. Multiple tension pneumatoceles are very rare in the pediatric population. There is no consensus in the literature regarding which lung is mostly affected.

Many modalities of treatment have been described in the literature. Image-guided percutaneous drainage, compression, catheter drainage and tube drainage are effective treatment modalities for single tension pneumatocele. Wu and Chen reported failed thoracostomy drainage in a patient with multiple pneumatoceles¹⁰. Pneumonostomy and lung resection surgery (lobectomy and pneumonectomy) have been performed in patients with multiple tension pneumatoceles or after failure of tube thoracostomy drainage¹¹. Our baby patient was first treated conservatively, then surgery done successfully and the baby's condition symptomatically improved.

Tension pneumatocele is a rare complication of pneumonia. Close observation in the early stages of the infection and periodic follow-up care until resolution of the pneumatocele is usually adequate treatment option. But some times surgical treatment is helpful for symptomatic improvement of patient's condition. Here a case of tension pneumatocele involving right hemithorax with collapsed right lung described. Surgical management done successfully with symptomatic improvement of baby's condition and complete expansion of right lung.

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