

CASE REPORT

5 Months Old Baby with Tension Pneumatocele - A Case Report

M.Anamul Hoque¹, M. Rahman Mia², Kazi.S.Islam²,N.Islam³, S.M. Zakirullah¹

Abstract :

Pneumatoceles are thin walled air-filled pulmonary cysts which commonly develop 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 collapse and may need definitive treatment. A case of 5 months old boy baby with tension pneumatocele in right lower lobe underwent lobectomy has been described here.

Keywords : Pneumatocele, pneumonia, S.aureus, tension, lobectomy.

[Chest Heart J. 2021; 45(1) : 47-52]

DOI: <http://dx.doi.org/10.33316/chab.j.v45i1.2019636>

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 radiograph¹. In all cases of pediatric pneumonia, the incidence of postinfectious pulmonary pneumatocele is about 2–8%. In a study by Kunyoshi et al.², more than 70% of those cases occurred in children younger than the age 3 years. In adults, the incidence of pneumatoceles is much lower, with only a few reported cases in the literature³. 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 valve⁴. Ultimately, this bronchial obstruction leads to distal dilatation of the bronchi and alveoli. 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 subpleuralemphysema⁵. We describe a case report of 5 months old boy baby with tension pneumatocele in right lower lobe underwent lobectomy by right postero-lateral thoracotomy.

Case Report :

Baby boy Rihan 5 months old son of Md. Mainul Islam and Mrs. Fatematuzzahura presented with respiratory distress and occasional cough from his birth. Baby's mother told, Sometimes this distress was very severe and needed oxygen inhalation and also nebulization. Mild dry cough was noticed

1. Registrar, Department of thoracic surgery, NIDCH, Dhaka.
2. Associate Professor, Department of thoracic surgery, NIDCH, Dhaka.
3. Assistant Professor, Department of thoracic surgery, NIDCH, Dhaka.

Correspondence to: Dr. Mohammad Anamul Hoque, FCPS (Surgery) Registrar, Department of Thoracic Surgery, NIDCH, Mohakhali, Dhaka. Mobile: 01712-636142, E-mail: dr.anamul27@gmail.com.

Submission on: 5 December, 2020

Accepted for Publication: 15 December, 2020

Available at <http://www.chabjournal.org>

during severe respiratory distress and associated with chest indrawing. Mother gave H/O, antenatally she experienced 4 times per vaginal bleeding but no other any illness or problems. Due to severe P/V bleeding H/O LUCS at 31 weeks of gestation on 02/07/20. At birth, baby's weight was only 2.1 kg and response was delayed. For severe respiratory distress, he was admitted in NICU at that time and treated about 20 days. When he was in NICU, done echo and found cardiac problems like ASD, VSD, PDA. After that his condition was stable but problems were not resolved completely at home. He was suffering from respiratory distress, fever, cough and visited to various doctors and again underwent echo which revealed no cardiac problems those found previously and treated as pneumonia. Lastly about 20 days ago, he was admitted to Dhaka Shishu Hospital for 10 days and done CXR, CT scan chest and diagnosed as a pneumatocele. For better and definitive treatment he was referred to NIDCH (reg.-4968/6). His father and mother had no co-morbidity. He came from middle class family. His feeding, bowel and bladder habit was normal. Already started vaccination according to EPI schedule. He had no other congenital abnormalities. On examination, baby looked healthy and had normal response. His respiratory rate was fast and found chest indrawing during distress. Breath sound was diminished in right lower part of chest.

Chest x-ray showed hyper translucent area in Rt. Lower zone and right lung also hyper inflated, mediastinum shifted to left side.

CT scan revealed multiple thin walled cavitory lesion in postero-basal segment like pneumatocele in right lower lobe with hyper inflated Rt. Lung. All other routine investigations found within normal limit.

So we planned for right lower lobectomy Under G/A with one lung ventilation. Patient underwent thorough pre anesthetic check up and surgery was performed. During procedure, there was no collection within thoracic cavity, adhesions were visualized between visceral pleura and chest wall in the right upper lobes and middle lobe of the lung by fibrous band. All adhesions were freed meticulously and then inspected all around. That lung found hugely hyper inflated and a cavitory lesion containing mainly air found in lower lobe.

Right lower lobe was mobilized. After ligation of all vessels, lower lobectomy was done. Then checked air leak and lung expansion properly. After secured haemostasis, a chest drain kept in situ and wound closed in layers. Obtaining materials were sent for histological analysis. Pneumatocele was confirmed histopathologically in our case. Post operative recovery was uneventful. On 6th POD chest drain removed and then discharged later.

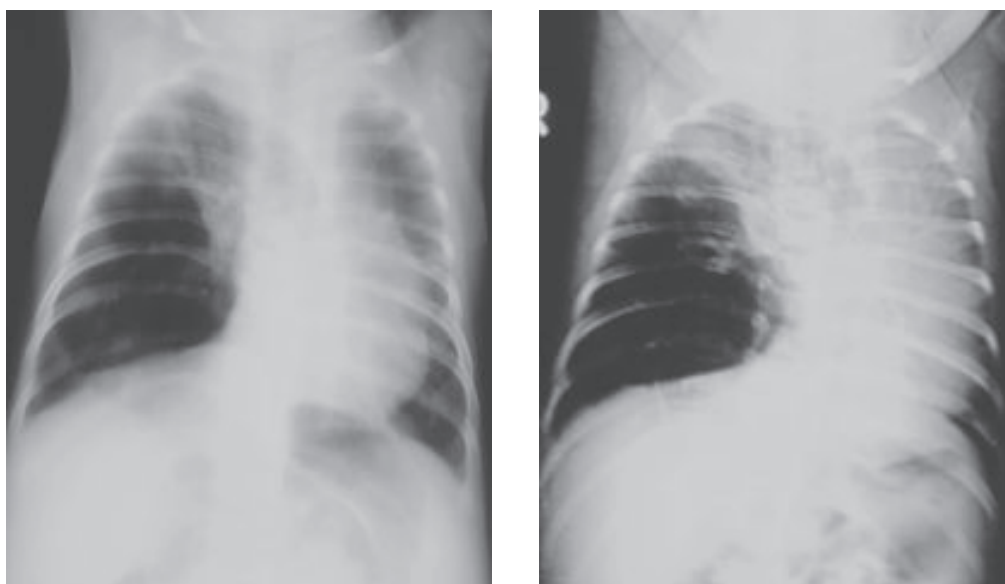


Fig.-1: X-ray Chest P/A view (pre-operative)

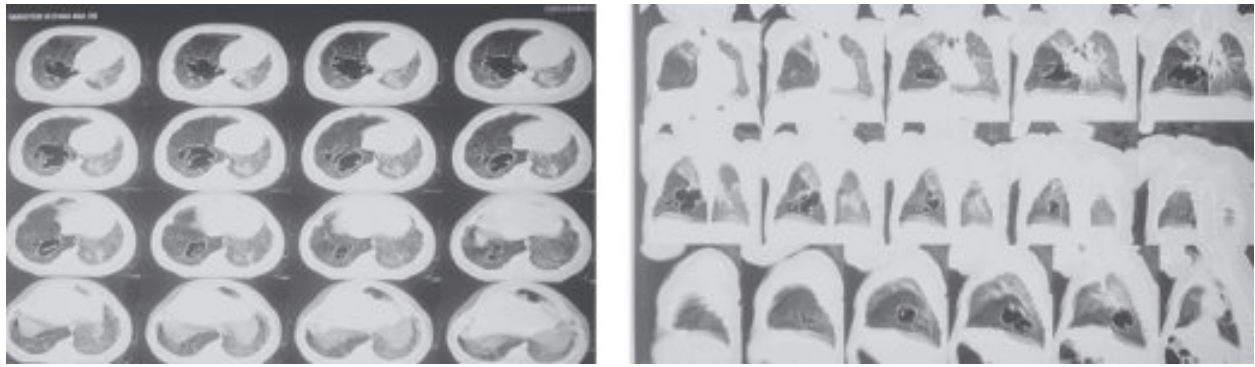


Fig.-2: *CT scan of the chest.*



Fig.-3: *Lesion in Lower lobe (Rt.)*

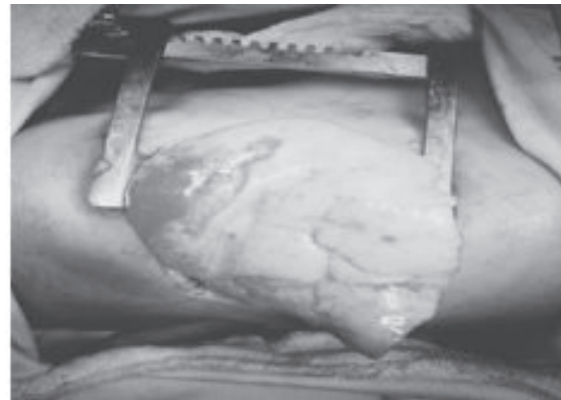


Fig.-4: *Hyperinflated lower lobe*



Fig.-5: *Re-expansion of remaining two lobes.*



Fig.-6: *Post. Operative wound*

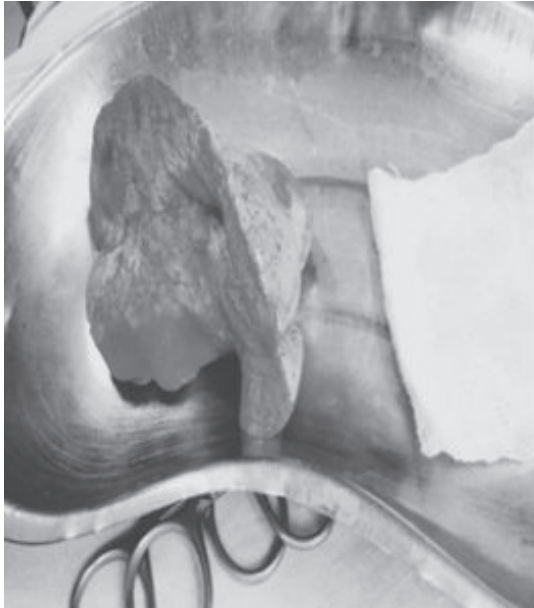


Fig.-7: *Excised rt. Lower lobe*



Fig.-8: *Cavity within that lobe*



Fig.-9: *Post operative x-ray*



Fig.-10: *During went to home*

Discussion :

Pulmonary pneumatoceles are air collections in the interstitium of the lung. Pneumatoceles can occur at all ages from infants to adults and may be solitary or multiple lesions. However, it is interesting that the predominant location of pneumatoceles is still in the right lung especially

the right lower and middle lobes; and the peak time of occurrence remains around the 7th day of life. It is twice as common in males as in females. 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 ventilation⁶. A study published in Australia detected pulmonary involvement in 82% of patients with staphylococcal sepsis and 21.9% of them presented pneumatocele⁷. In the U.S., in a study on 493 children with pneumonia, the frequency of pneumatocele was 2.4%⁸. The physiopathogenesis of pneumatocele is still unknown. The most widely accepted hypothesis suggests that in necrotizing pneumonias, tissue destruction leads to structural defect in small bronchioli and parenchyma that allow air passing to the interstitial space, resulting in an intraparenchymal ventilated cyst with thin walls. The valve mechanism related to secretion and necrotic material causes increased pressure in the defect region. This raise in pressure leads to expansion of the necrotic area inside the cavity. Air passage may increase pressure inside the pneumatocele, resulting in its expansion and compression of adjacent areas with cardiovascular and respiratory impairment (hypertensive pneumatocele). The pneumatocele may rupture into the pleural space causing pneumothorax and/or bronchopleural fistula⁹. The presence of a pneumatocele is an independent risk factor for pneumothorax in patients with *Pneumocystis carinii* pneumonia, and sudden pneumothorax as a result of ruptured pneumatocele has resulted in reported mortality¹⁰. Most pneumatoceles do not cause severe symptoms and resolve spontaneously within weeks or months by treating the primary condition, and with no clinical or radiological sequelae. Children present with typical features of pneumonia, including cough, fever, and respiratory distress. No clinical findings differentiate pneumonia with or without pneumatocele formation. However, pneumatoceles complicated by rupture, hypertension or infection are very severe and require immediate treatment. There is no algorithm established to treat pneumatoceles so far. Tension pneumatocele enlarges significantly compressing adjacent lung and mediastinum resulting in cardiovascular collapse¹¹. Diagnosis can be made using chest X-ray; the lesion shows up as a small, round area filled with air. Computed tomography (CT) can give a more detailed understanding of the lesion. Lung ultrasonography (LUS) is a promising technique

used to investigate neonatal pulmonary diseases. LUS showed a multilobed cyst with a thin hyperechoic wall and a hypoechoic central area. Repeated LUS demonstrated a progressive reduction of the cyst's size for follow-up. In laboratory studies: If findings are positive, blood culture helps to guide antibiotic therapy in patients with pneumatocele. If sputum is available, this is a good noninvasive method to discover potential pathogens. If effusion is present, culturing pleural fluid from thoracentesis can be a direct method to identify the causative organism. Tests for bacterial antigen detection can be performed on blood, urine, and pleural fluid. Many modalities of treatment have been described in the literature. Image-guided percutaneous drainage, compression, catheter drainage and tube drainage as well as lung resection surgery (lobectomy and pneumonectomy) are effective treatment modalities of pneumatocele¹². Our baby had symptomatic tension pneumatocele in right lower lobe with shifting of mediastinum to the left which was treated conservatively first and then surgical management done successfully with symptomatic improvement of baby's condition and complete expansion of right lung.

Conclusion :

Complicated pneumatocele is a severe disease especially in younger age groups. In a resource-limited center like ours, there is a role for tube thoracostomy in the management of tension pneumatocele; however, if they do not resolve or if they are more than 2, lung resection surgery becomes the preferred modality of management.

References:

1. Arora P, Kalra VK, Natarajan G. Pneumatoceles in infants in the neonatal intensive care unit: clinical characteristics and outcomes. *Am J Perinatol.* 2013;30:689-694.
2. Kunyoshi V, Cataneo DC, Cataneo AJ. Complicated pneumonias with empyema and/or pneumatocele in children. *Pediatr Surg Int.* 2006 Feb;22(2):186-90.
3. Bajpai J, Kant S, Verma AK, Bajaj DK. Spontaneous lung pneumatocele in an adult with community-acquired pneumonia. *Egypt J Intern Med.* 2017;29(3):141-3.
4. Carrey J. On the natural regression of pulmonary cysts during early infancy. *Pediatr.*

- 1953;11:48-64.
5. Boisset GF. Subpleural emphysema complicating staphylococcal and other pneumonias. *J Pediatr*. Aug 1972;81:259-266.
 6. Liao Wan-Hsiu LW, Hsiang LS, Tuan WT. Pneumatocele formation in adult pulmonary tuberculosis during antituberculous chemotherapy: a case report. *Cases Journal* 2009, 2:8570:1-3.
 7. Caksen H, Ozturk MK, Uzum K, Yuksel S, Ustunbas HB. Pulmonary complications in patients with staphylococcal sepsis. *Pediatr Int*. 2000;42(3):268-71.
 8. Amitai I, Mogle P, Godfrey S, Aviad I. Pneumatocele in infants and children. Report of 12 cases. *Clin Pediatr (Phila)*. 1983;22(6): 420-2.
 9. Zuhdi MK, Spear RM, Worthen HM, Peterson BM. Percutaneous catheter drainage of tension pneumatocele, secondarily infected pneumatocele, and lung abscess in children. *Crit Care Med*. 1996;24(2):330-3.
 10. Hunt JP, Buechter KJ, Fakhry SM. Acinetobacter calcoaceticus pneumonia and formation of pneumatoceles. *J Trauma*. 2000;48:964-70.
 11. Kesieme EB, Akpede GO, Kesieme CN, Okonta KE, Dongo AE, Gbolagade AM, et al. Tension Pneumatocele due to *Enterobacter gergoviae* Pneumonia: A Case Report. *Case Reports in Medicine*. Hindawi Publishing Corporation. Volume 2012:Article ID 808630:1-3.
 12. de Campos JR, Andrade Filho LO, Werebe EC, Minamoto H, Chuim AO, Filomeno LT, et al. Thoracoscopy in children and adolescents. *Chest*. 1997;111(2):268-9