

Dramatic Improvement of Adult Patients with Post Tuberculosis Pulmonary Pneumatocele and Bad Pulmonary Function after Surgical Intervention.

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ABSTRACT

Pulmonary pneumatoceles (PCs) are thin-walled, air-filled cysts that develop within pulmonary parenchyma. PCs are usually seen in the lung after infection, trauma. In case of infection, as a complication of acute pneumonia, caused by *Staphylococcus aureus*, and are more frequently in infants and children. Adult tuberculous pulmonary pneumatoceles are seldom reported. PCs are usually asymptomatic. Large PCs may compress adjacent lung with mediastinal shift causing respiratory or cardiovascular symptoms. Surgical intervention is only indicated when PCs cause cardiopulmonary compromise or rupture into the pleural space or unresolved infection.

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Introduction:

Pulmonary PC is thin walled air-filled cyst, which mostly develops within lung parenchyma as a complication of pneumonia. It may be a result of trauma or PPV

(1). Traumatic pneumatoceles are most often seen in children and young adults and associated with pulmonary contusion, pneumothorax, and pneumomediastinum (2).

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PC is frequently present in children as complications of Staphylococcal pneumonia. However, it is seldom present in adult. The diagnostic accuracy of chest X-Ray (CXR) ranges between 24% - 50%. Computed Tomography (CT) is much more accurate, with a reported sensitivity of 96%. CT scan more precisely defines the location and size of the cyst and provides early detection and differential diagnosis (3).

The mechanism PC formation is due to parenchymal necrosis which allows one-valve mechanism of air into interstitial space. Surgical intervention is only required if PC complicated and causing symptoms. Complicated PC is lifesaving condition required urgent surgical intervention (4). We should be minded to differentiate between PC and others similar conditions like; cavitary lung cancer, or metastasis, hydatid cyst, encysted pneumothorax, large emphysematous bulla in old patients (5).

Case Report

Patients confirm that have read and understood the information about the research publication as provided in the participant information sheet inside their files. We report three cases of adult females who presented with breathlessness for 4 weeks associated with dry cough.

Case 1

60-years old female patient was presenting by dry cough and shortness of breath (SOB). She was on long-term corticosteroid therapy 3 months duration as treatment of bronchial asthma. She was asthmatic on inhaled corticosteroids then shifted to oral corticosteroids (prednisolone 30 mg od) for the last 3 months. She was admitted in a chest department in respiratory distress with a respiratory rate of 24/min, SO_2 93% at O_2 flow 6 L/min by a nasal cannula. She had history of resolved pulmonary TB. Clinical examination revealed diminished air entry on the affected side. CXR showed translucent zone like; encysted pneumothorax. CT with contrast was done and showed large PC occupying more than $2/3$ of hemithorax with mediastinal shift and cardiorespiratory compression. CT guided catheter was placed inside cyst to relieve the symptoms, however still air leak and lung not completely inflated. PFT was done as preparation for surgery. Mini-thoracotomy

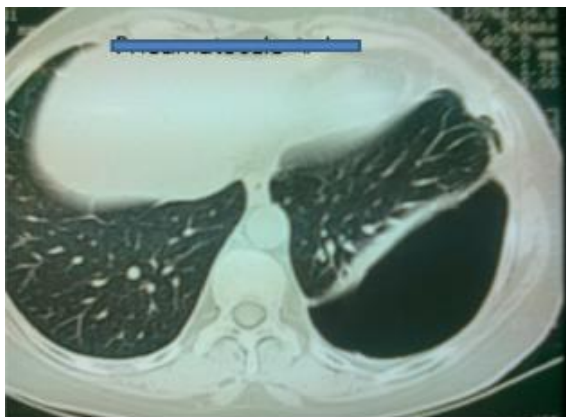
was performed with repair of fistula after PC rupture (Figure 1, 2).

Case 2

45-years old female patient was presented by SOB, fever, and yellowish sputum. SO_2 was 95% on 2 L/min. She had a history of bronchial asthma on cortisone (inhaler and oral), and admission to chest hospital for TB treatment 2 years ago. Sputum culture and sensitivity was done for antibiotics and TB. She was treated with nebulized salbutamol and ipratropium bromide, IV antibiotics (Meropenam). After 2 weeks, they improved and a CXR revealed zones of radiolucency in the parenchymal shadows. Chest CT showed multicystic PC. PFT was done preoperative. Surgical excision of cyst and repair of defect was performed through VATS.

Case 3

60-years old female patient was presented by mild hemoptysis with previous history of pulmonary TB. Chest CT showed fungus ball inside PC in right upper lobe. Hemoptysis was controlled by medical treatment and bronchoscopic examination was done before surgery for diagnosis. Mini-thoracotomy was performed, excised the cyst and fungal ball. Histopathological report was confirmed aspergilloma. Anti-fungal drugs were given for long period (Figure 3). PFT was done for all cases ($FEV_1 < 1.5$ L. $FEV_1/FVC < 70\%$). An Epidural Analgesic (EA) catheter is placed by an anesthesiologist before surgery when the patient is awake. EA with infusion through the catheter of Fentanyl (10 μ g/mL) with 0.1% Bupivacaine. EA relieved post thoracotomy pain to avoid retained secretion and atelectasis. During operation, patients were under general anesthesia, and monitoring was established with ECG, pulse oximetry. Rupture of PC by diathermy to avoid its over-inflation during ventilation, and then wedge resection of parenchymal area containing cyst with lung repair. The excised portion was sent for pathological examination. After that, closure of thoracotomy was performed as a routine with two ICT. Postoperative revealed full inflated lung without mediastinal shift. Pathological report of excised wedge revealed no evidence of infection or malignancy. ICT was removed on 3rd - 5th POD. They discharged from hospital mild dyspnea and with uneventful postoperative



course. **Figure 1:** Chest CT revealed large pneumatocele (Tension PC)



Figure 2: Intra operative mini thoracotomy showing multicystic pneumatocele.



Figure 3: Chest CT revealed fungal ball inside pneumatocele.

Discussion

PC is air collection in pulmonary interstitial space. Mostly, it occurs as a complication of bacterial pneumonia. It may be caused by hydrocarbon ingestion, trauma, and secondary to PPV. The formation of PC in adult can occur before, during or after anti-TB treatment, however it had been very rarely reported, and the development of its complications were variable (3). In our cases, there was a history of resolved TB. A TB investigation was -ve before surgery. PC is a common complication of pneumonia, and

may be enlarged markedly in size, causing cardiorespiratory compromise. Post-pneumonic PC may result from rupture of bronchiolar walls and accumulation of air between the visceral pleura and parenchyma resulting in sub-pleural PC. Expanding or tension PC may result from a one-way valve action at the site of rupture (6). We reported one case of tension PC and percutaneous catheter was inserted inside it to resolve its compression, until preparation for surgery. The clinical picture should be taken into account and not just the size while treating pneumatocele. So, percutaneous catheter was placed under imaging in case of tension PC. Anaerobic pneumonia complicated by a PC in an adult has reported. PC occurred on 5th day of hospitalization, and may be increased in size (7,8). We did sepsis workup in cases to exclude and treatment infection. Spontaneous resolution of PC usually occurs after a few weeks especially in children with chest infection. Urgent surgery indicated in complicated PC like; infection, tension, and rupture. Tension PC is a life-threatening condition, needed urgent pneumonostomy then surgery (6,9). As, we faced tension PC, ICT was inserted for pneumonostomy, then VATS procedure was performed to PC excision and repair. PC is an uncommon complication in mechanically ventilated (MV) premature infants with respiratory distress syndrome and pneumonia. Tension PC is failed conservative management with high frequency ventilation (10). Although there is no clear correlation between the development of pneumatoceles and MV, patients receiving MV have an increased risk for developing complications related to pneumatoceles, including an increase in their size (11). Unresolved infection, and severe atelectasis, and bad tolerance to follow-up are indications of image-guided catheter drainage procedure. Its failure occurs in PC with thickened wall that does not collapse, so surgical intervention is needed (12). We used ICT for more decompressing and leakage of air from thoracic because of wide caliber and no risk of blockage. Lobectomy was a life-saving emergency procedure to relieve the tension effect on lung, if there was no feasible alternative. Lobectomy resulted in a dramatic improvement in the patient's ventilation

(11). However, our patients' pulmonary functions were not suitable for lobectomy. Early accurate diagnosis is the keystone to a successful outcome. Inaccurate diagnosis of PC may lead to unnecessary, and harmful intervention, like; misdiagnosis of PC as a pneumothorax may lead to placement of ICT. However, ICT placement directly into the pneumatocele is a relative simple bedside procedure and avoids more complicated surgical procedure in acutely ill and in emergency situations (13). Also, in that case surgery was standby, if the patient was deteriorated. Upper lobe is the common site of aspergilloma. Its diagnosis was made primarily on the CXR, which was showing "fungus ball" and Chest CT. Fungal ball does not respond to antifungal drugs, as they did not reach high concentration within lung cavity or PC. Surgery is indicated in all cases to avoid life threatening hemoptysis (14). As we faced with a case of complicated PC by aspergilloma and hemoptysis, urgent surgery was performed. There is no algorithm established to treat PC so far. Decompression of tension PC was done by CT-guided percutaneous catheter or placement ICT. The main indications for VATs in these cases are pleural biopsy for diagnosis of pleural effusion and treatment of pneumothorax or empyema, when there are complications of pneumatocele(15). However, VATs is wider use in thoracic surgery nowadays.

Conclusion

Surgical excision of symptomatic complicated pulmonary pneumatocele with mini approach after well preparation gives marvelous improvement of respiratory condition.

Abbreviations

PC: Pneumatocele, **VATs:** Video-Assisted Thoracic Surgery, **MV:** Mechanical Ventilation. **PPV:** Positive Pressure Ventilation. **PFT:** Pulmonary Function Test, **TB:** Tuberculosis, **ICT:** Inter Costal Tube, **CT:** Computed Tomography, **CXR:** Chest X-Ray, **COPD;** Chronic Obstructive Pulmonary Diseases

Conflicts of interest

The authors have declared no conflict of interest.

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