

Case Report

Fissural Pleural Effusion Presenting As ‘Pseudotumor Lung, Phantom Tumour or Round Pneumonia’ In Primary Pulmonary Tuberculosis: Bronchoscopy is Point of Care Test in Presence of Satellite Nodules in Chest Imaging!

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Abstract: Pulmonary Tuberculosis has diverse radiological presentations such as consolidation, cavitation, airway disease, pleural effusion and lymphadenopathy. Pneumonia-like presentation in tuberculosis is very commonly reported in Pulmonary Tuberculosis. Fissural effusion is common in cardiac failure and isolated fissural effusion is rarely described in literature with etiology as tuberculosis. Round pneumonia is commonly described in pediatric cases with community acquired pneumonia and also frequently reported in childhood pulmonary tuberculosis. Round pneumonia is very infrequently reported in adults with pneumonia and to very few published data as due to tuberculosis. In this case report, a 21-year female, presented with constitutional symptoms for 3 months duration with partial response to medical treatment received in line with pneumonia, bronchial asthma and bronchitis. Radiological investigations documented round opacity in right mid-zone with no adventitious breath sound on clinical examination. Recurrent, progressive and partially responding constitutional symptoms was the reason for referral to our center. We have further evaluated with HRCT thorax and documented loculated right horizontal fissural effusion with subpleural parenchymal opacity in right upper lobe posterior segment and right middle lobe lateral basal segment with peri-consolidation satellite nodules in right posterior segment. We have done bronchoscopy due to negative induced sputum microbiological workup. Bronchoscopy guided BAL microbiological workup documented MTB genome with rifampicin sensitivity in cartridge based nucleic acid amplification test and negative BAL smear for AFB. Treatment initiated with anti-tuberculosis (ATT) and recorded near complete radiological resolution, bacteriological cure after six months with good compliance. High index of suspicion is required while managing these cases with constitutional symptoms and typical radiological features such as ‘round pneumonia or fissural effusion’ in absence of other causes for the same. Fissural effusion or round pneumonia due to tuberculosis is rare in adults but not uncommon. Bronchoscopy is a gold standard test to confirm etiological diagnosis due inadequate or poor quality of induced sputum sample in cases with round pneumonia and fissural effusion. Isolated Fissural effusion secondary to pulmonary tuberculosis is extremely rare in medical literature and this will be first case reported till date.

Keywords: Pulmonary Tuberculosis, Fissural Effusion, Round Pneumonia, HRCT Thorax, Bronchoscopy, Gene Xpert MTB/Rif.

INTRODUCTION

Tuberculosis (TB) continues to be a major threat to global health. Cavitation is a dangerous consequence of pulmonary TB associated with poor outcomes, treatment relapse, higher transmission rates, and development of drug resistance. However, in the antibiotic era, cavities are often identified as the extreme outcome of treatment failure and are

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one of the least-studied aspects of TB. [1] Pulmonary tuberculosis can have diverse presentations ranging from cavitation, consolidation, tumorous lesions, coin lesions, lower lung field tuberculosis and endobronchial and miliary nodules. [2- 12] Similarly, non-tuberculous pathologies can present with abnormalities such as consolidations, nodules, cavitations mimicking tuberculosis. [2-14] Bronchoscopy is a very crucial interventional pulmonology technique in evaluating these cases. [2-14] High risk factors for tuberculosis would be advanced age, malnutrition, pregnancy, steroids exposure, diabetes mellitus and immunosuppression. [9-14] Tuberculosis in advanced stage may cause cardiac dysfunction and systemic effects which will have poor outcome if timely treatment not received [15-17].

Final outcome in delayed treatment initiation may lead to destroyed lung as post tuberculosis sequel and proportionate number of cases may have lung function abnormalities irrespective of radiological outcome. [18-22] Tuberculosis may be misdiagnosed due to confusing or overlapping clinical and radiological features in high burden setting like India [24-30].

CASE SUMMARY

21-year-old female, college student with no addiction history, normotensive, non-diabetic, referred to our center by family physician for recurrent respiratory and generalized constitutional symptoms. She was having fever which is lasted for 3 months, intermittent, low to moderate grade without chills and rigors associated with minimal body ache and headache. She was treated as case of pneumonia right lung initially for one month and then as bronchial asthma for additional one month. She was referred to Internal medicine specialist where she was evaluated for non-resolving round pneumonia and treated as pneumonia for additional two weeks. She was referred to our center for non-resolving pneumonia in right lung presented as ‘round pneumonia’. Clinical examination revealed thin built female with normal vital parameters and general physical examination. Respiratory system examination documented vesicular breath sounds in all lung zones bilaterally & adventitious breath sounds such as crepitations over right infraclavicular and interscapular area. Other systemic examinations were normal. We have assessed past records of treatment as chest x-ray showing round to oval tongue shaped homogenous opacity with inhomogeneous infiltrates in right upper zone and normal left lung zones with clear costophrenic angles on both sides. [Image 1]

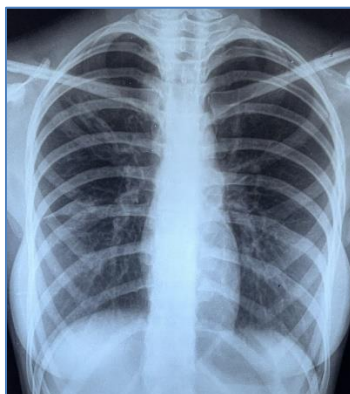


Image 1: chest x-ray PA showing round to oval tongue shaped homogenous opacity with inhomogeneous Infiltrates in right upper zone

Second X-ray done at our center revealed persistent round to oval tongue shaped opacity with inhomogeneous infiltrates in right upper zone and normal left lung zone. [Image 2]



Image 2: chest x-ray PA showing tongue shaped opacity in right middle zone with inhomogeneous infiltrates right upper zone

We have further evaluated with HRCT thorax for persistent round to oval tongue shaped opacity with inhomogeneous infiltrates in right upper zone and normal left lung zone with constitutional symptoms to rule out chronic infective pathology such as tuberculosis for 'nonresolving round pneumonia'.

HRCT Thorax

1. Round opacity occupying and abutting horizontal fissure of right lung. This round opacity with well demarcated borders presenting in lateral aspect of horizontal fissure and mimicking as Round Pneumonia. [Image 3-5]
2. Round opacity in right lung involving posterior segment of upper lobe and lateral segment of right middle lobe with horizontal fissure mimicking as 'Pseudotumor' or 'Fissural effusion' [Image 3-5]
3. Inhomogeneous lung parenchymal infiltrates in right upper lobe posterior segment with breakdown and nodular opacities accompanying these infiltrates and tiny consolidations at some part mimicking like acinonodular opacities. Acinonodular opacities are described in right upper lobe posterior segment which were not picked up on routine chest radiograph. [Image 3-5]
4. Satellite nodules surrounding consolidation in posterior segment of right upper lobe which is markers of bronchogenic and lymphohematogenous spread of chronic infective process such as tuberculosis. [Image 3-5]
5. Peribronchiolar consolidation in right middle lobe medial basal segment suggestive of chronic infective process such as tuberculosis. [Image 6]
6. Left lung parenchyma normal. Central and peripheral airways have normal lumen without obvious pathology. Both costophrenic angles clear.
7. Pulmonary vasculature and mediastinum normal. Cardiac silhouette and pulmonary vasculature normal.

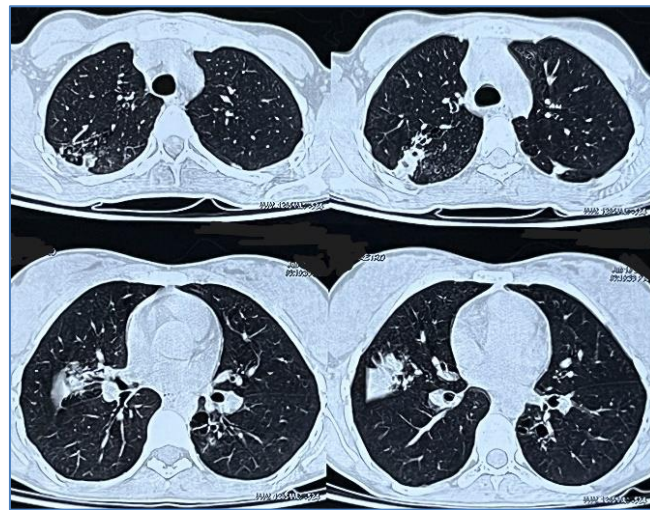


Image 3: HRCT Thorax showing round opacity at lateral aspect of horizontal fissure mimicking 'round pneumonia'



Image 4: HRCT Thorax showing inhomogeneous airspace opacities in right upper lobe posterior segment with nodular opacities accompanying consolidation



Image 5: HRCT thorax showing ‘fissural effusion’ or opacity mimicking ‘Pseudotumor’

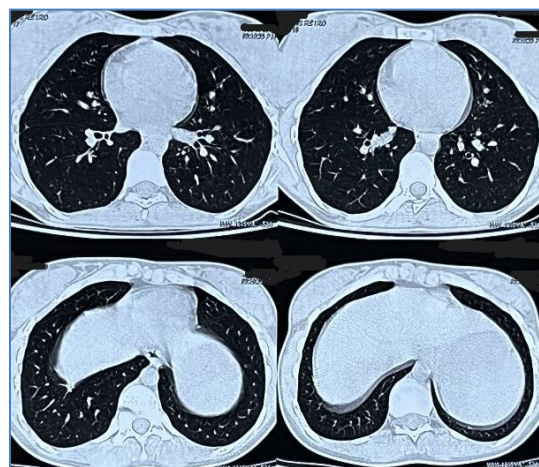


Image 6: HRCT thorax showing peribronchiolar consolidation in right middle lobe medial basal segment

We have further evaluated with induced sputum examination of early morning sample on two consecutive days which was inclusive and doesn't give etiological diagnosis. We have performed fiberoptic videobronchoscopy and guided BAL sample sent for Gene Xpert MTB/RIF or CBNAAT test (cartridge based nucleic acid amplification test) as per NTEP (National tuberculosis elimination program). BAL smear was negative for acid fast bacilli and TB Gene Xpert MTB/RIF test shown MTB genome (mycobacterium tuberculosis genome) and rpo-b (rifampicin-beta) mutation negative. During hospitalization, we have started supportive care till final reports came with intravenous fluids and beta-lactam antibiotics. We have stopped antibiotics after BAL examination documented as tuberculosis and started ATT (Anti-tuberculosis treatment) as per weight band with Isoniazid, Rifampicin, Pyrazinamide, Ethambutol. She was discharged to home after one week of treatment with four drug ATT. After 2 months of treatment, radiological response documented with clearance of radiological abnormalities.

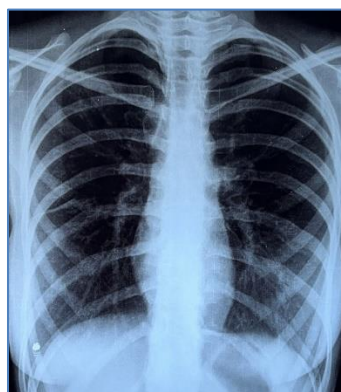


Image 7: chest x-ray PA at 6 months showing complete resolution of lung opacity

After completion of intensive phase, she was shifted to continuation phase with Isoniazid, Rifampicin, Ethambutol without steroids. Radiological follow-up examination done at 6 months shown near complete resolution of infiltrates in right upper zone and pseudotumor or round pneumonia like opacity in right middle zone with normal lung parenchyma in both lung fields (Image 7). She tolerated complete course of ATT for six months as per National guidelines and documented 'cure' of tuberculosis. Clinical and radiological response documented after completion of ATT with complete resolution of radiological abnormalities in chest X-ray.

DISCUSSION

A pseudotumor of the lung is a well-defined loculated pleural effusion in the pulmonary fissure. It is associated with conditions that cause fluid accumulation, such as congestive heart failure, renal failure, and hypoalbuminemia and is typically diagnosed presumptively on chest radiographs based on its lenticular configuration. However, intraparenchymal pulmonary pseudotumor such as inflammatory pseudotumor, organizing pneumonia, rounded atelectasis, and nodular lymphoid hyperplasia should be ruled out prior to diagnosis.

No direct treatment is required beyond management of the underlying condition and control of volume overload [31]. Inflammatory pseudotumors (IPT) of the lung are extremely rare. IPT was first described by Brunn in 1939. It may occur anywhere in the body, but most commonly affects the lung and orbit. It accounts for less than 1% of lung resections.

According to most authors, it represents a genuine neoplastic process, but some argue that it may represent an exaggerated inflammatory response to a variety of stimuli including minor trauma and infectious agents such as mycobacteria, Epstein-Barr virus, actinomyces, nocardia, mycoplasma and herpes simplex virus.

Immunoglobulin G4-related sclerosing disease is a recently described autoimmune process that histologically resembles IPT and may be related to the adult form of the disease [32]. Histological confirmation is must before diagnosis of pseudotumor is made.

In heart failure localized interlobar pleural effusion is rare but well-known finding¹. Because this radiological finding seems like a mass and undergoes resolution quickly, it is also known as vanishing tumor, pseudotumor or phantom tumor.

It is difficult to estimate the incidence due to the small number of reported cases. Phantom tumor can be frequently observed on right side of the chest in males. It is seen mostly in transverse fissure, less frequently in oblique fissure and rarely in both [33]. Adhesions caused by previous pleuritis in the pleural space may take a role in the pathogenesis.

When transudative fluid infiltrating from pulmonary bed to pleural cavity reaches the capability of lymphatic resorption, it starts to accumulate and form the phantom like tumor. Transudative fluid accumulation in the left heart failure, renal failure, hypoalbuminemia can also be monitored. Exudative fluid accumulation is seen in pneumonia, tuberculosis, malignancies and asbestosis. In addition to these, haemothorax, silotorax, interlobar fissure as well as pleural fibrous tumours can be seen. Phantom tumor can relapse in recurrent decompensation in patients with heart failure. Radiological improvement can be observed in less than 24 h after introducing diuretic infusion treatment [33].

Round pneumonia has been defined as an oval or round shaped consolidation distributed in a nonsegmental pattern, found mostly in children. Owing to its radiological appearances, it stimulates bronchogenic carcinoma particularly in adults. Round pneumonias are roundish and although they are well circumscribed parenchymal opacities, they tend to have irregular margins.

The typical location is the posterior and lower lobe. Streptococcus pneumonia is the most common pathogen of spherical pneumonia in both adults and children, and other pathogens include Klebsiella pneumoniae, Haemophilus influenzae, and Mycobacterium tuberculosis. Unusual radiographic patterns in pulmonary tuberculosis presenting with mass-like densities, most of which were initially and mistakenly diagnosed as neoplasm, have been uncommonly seen in the past. Round pneumonia should be suspected in an adult patient who presents with a pulmonary mass, especially if he has respiratory infection symptoms, is a young nonsmoker, and has no other findings to suggest malignancy. Any patient with a pulmonary nodule that does not decrease in size or resolution after antibiotic treatment should be further assessed with bronchoscopy or transthoracic needle biopsy [34-35].

Fein and Feinsilver [36] have provided useful practical definitions for different types of treatment failures. They suggest that delayed clinical and/or radiographic improvement should be addressed as "slowly resolving pneumonia," persistent infiltrates in chest radiograph as "non-resolving pneumonia," and clinical deterioration as "progressive

pneumonia.” Incorrect diagnosis, inadequate antibiotic therapy, impaired host defence, atypical organisms, resistant pathogens, non-infectious causes, tuberculosis, endobronchial lesions, etc. are the common causes of non-resolving pneumonia or slowly resolving pneumonia. Slow or incomplete resolution of pneumonia, despite treatment, needs a more aggressive evaluation. Fiberoptic bronchoscopy (FOB), computed tomography (CT) scan of the thorax and CT-guided fine needle aspiration cytology (FNAC) may be helpful in the evaluation of non-resolving or slowly resolving pneumonia. Microbiological, cytological and histopathological tests of the specimens can be done for etiological diagnosis of underlying cause. Efficacy of CT-guided FNAC and FOB in the etiological diagnosis of non-resolving or slowly resolving pneumonia has been around 80% and 70-86%, respectively in some studies.

Round Pneumonia or fissural Effusion and Pulmonary Tuberculosis

Round pneumonia is most often encountered in children than adults and is most often caused by *Streptococcus pneumoniae*. A literature search for round pneumonia in adults reveals this is an uncommon problem in adults. Round pneumonia may mimic pulmonary neoplasms due to its radiological appearance. Awareness of this disease is important.

Round pneumonia has been reported to comprise fewer than 1% of cases of pneumonia, but the actual incidence is probably higher than reported [37]. *M. tuberculosis* can invade various organs of the body. Pulmonary tuberculosis (PTB) is the most common, which can mainly cause lung injury and tubercles. PTB is a typical chronic consumptive disease, but it can present as an acute pneumonia. Acute tuberculous pneumonia (TP) is similar to typical bacterial pneumonia, and it is one of the causes of childhood illness. Acute TP generally refers to the clinical manifestations of community-acquired pneumonia (CAP), but the pathogen is *M. tuberculosis* instead of non-tuberculous bacteria or viruses [38-39].

In developing countries, *M. tuberculosis* is a main pathogen that cause CAP. A systematic review found that over 10% of patients with CAP in Asia were caused by *M. tuberculosis* [40]. Different from typical PTB, acute TP presents as acute respiratory infection, including dry cough, fever and chest pain. Dry cough often precedes other respiratory and systemic symptoms. Duration of symptoms is often more than 2 weeks prior to admission. The clinical symptoms of acute TP are similar to those of non-tuberculous CAP. However, patients with acute TP are subjectively better than patients with non-tuberculous bacterial pneumonia with less pleural pain, toxemia and dyspnea. Compare to non-tuberculous CAP, weight loss is more common in patients with acute TP. Many patients with acute TP expectorate, but hemoptysis is relatively rare [41].

Importance of Satellite Nodules in ‘Round Pneumonia’ Secondary To Tuberculosis

- Satellite nodules are defined as ill-defined to well demarcated nodular opacities with or without conglomeration around tuberculous consolidation or cavity.
- Satellite nodules are marker of active pulmonary tuberculosis and rare in healed disease
- Satellite nodules indicates bronchogenic and lymphatic spread of tuberculosis from local tuberculosis consolidation or cavity
- Satellite nodules in cavitary lung disease usually occurs as a result of bronchogenic and lymphatic or hematogenous spread of disease.
- Satellite nodules in tuberculous consolidation indicates lymphatic and hematogenous spread without bronchogenic spread of disease.
- Satellite nodules should be differentiated from Tree in bud opacities which is indicator of bronchogenic spread with bronchiolitis.
- Satellite nodules can be random as in miliary, and perilymphatic, subpleural or centrilobular which usually occurs due to lymphohematogenous spread of disease.
- Satellite nodules is the direct radiological sign of active disease.

CONCLUSION

In the present case report, we have reported a 21-year female with constitutional symptoms treated as tropical pulmonary disease such as round pneumonia and bronchial asthma in correlation to round opacity in chest radiology imaging. HRCT has documented classically described round pneumonia with fissural effusion, inhomogeneous infiltrates right lung and satellite nodules. We have confirmed active pulmonary tuberculosis by Bronchoscopy guided BAL microbiological workup. Clinical & radiological cure documented after six months of ATT as per NTEP.

Learning Points

1. Round pneumonia is very frequently described in paediatric pneumonia and Tuberculosis is very frequently reported now due to nucleic acid amplification tests. Round pneumonia is rare in adults and Tuberculosis as cause of round pneumonia is infrequently described in literature.

2. Pseudotumor is fissural effusion also called as vanishing tumours is common due to noninfective and inflammatory conditions but uncommonly associated with tuberculosis. Subpleural focus in the posterior segment of upper lobe and lateral segment of middle lobe may be the pathophysiology for Pseudotumour-like presentation secondary to tuberculosis.
3. Fissural effusion is common but rare in Tuberculosis unless it is associated with subpleural lung parenchymal focus. Isolated Fissural effusion secondary to pulmonary tuberculosis is extremely rare in medical literature and this will be the first case reported till date.
4. Satellite nodules are defined as nodular opacities adjacent to pulmonary primary cavitary lung disease and indicator lymphatic local spread and active pulmonary tuberculosis. Satellite nodules in important radiological clues to suspect tuberculosis may be underlying pathology then other causes.
5. Nonresolving pneumonia is very frequently reported in pneumonia in adults with TB as frontline cause in India. One setting is partial response to conventional antibiotics with off fluoroquinolones panel and second setting is relapsing nature of pneumonia after some time of stoppage of fluoroquinolone-based regimens is the real clinical and practical clue for aggressive workup to rule out underlying tuberculosis. Clinical, laboratory and radiological discordance is another clue to work towards tuberculosis.
6. HRCT has a superior role to conventional chest x-ray in cases with round pneumonia and fissural pathology. HRCT will help in delineating lung parenchyma, and other associated features such as satellite nodules, interstitial involvement, pulmonary vasculature and mediastinal adenopathy. These associated features will help in ruling out differentials and guide further battery of tests to reach to final diagnosis. Thus, HRCT plays a vital role in round pneumonia in predicting etiological causes.
7. Bronchoscopy is the gold standard technique to evaluate round pneumonia as it will give more accurate samplings for microbiological and cytology analysis. As majority of cases with round pneumonia or fissural effusion will have cough with minimal to negligible sputum production and chances of false negative microbiological workup for tropical screen is very high. Bronchoscopy is a minimally invasive, sensitive and cost-effective technique to reach final diagnosis.
8. Bronchoscopy guided BAL is the best method to confirm etiological diagnosis in round pneumonia and cases with non-resolving pneumonia. Yield of BAL is proportional to satellite nodules in Tuberculosis in HRCT thorax. BAL samples processed for nucleic acid amplification tests have very good sensitivity for tuberculosis in correlation to conventional sputum or induced sputum analysis. BAL samples will definitely give diagnosis in the majority of cases.
9. Response to ATT is a good 'clinical test of cure' in cases with round pneumonia or fissural effusion and scenario with negative microbiological workup even after bronchoscopy and high index of clinical suspicion for tuberculosis. In the era of Nucleic acid amplification tests, all possible efforts should be taken to document MTB genome in microbiological samples and no empirical ATT should be given. ALL measures should be taken to document drug sensitivity patterns before initiation of ATT, at least rifampicin sensitivity patterns should be done in all TB cases.
10. X-ray positive TB case, Clinical TB case or TB case with negative microbiological workup should be phased out due to chances of increased drug resistance. Trainings of community physicians for chest radiology and bronchoscopy is must to prevent increase in chances of empirical ATT, delayed initiation of ATT, underdiagnosis of TB and to decrease mortality and morbidity due to TB with decrease in cost of care due to this easily treatable disease.

CONFLICTS OF INTEREST: NIL

RESEARCH FUNDING: NIL

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