

Pulmonary Alveolar Microlithiasis : “Sand Clock of Life”?

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Abstract: Pulmonary alveolar microlithiasis is a rare diffuse lung disease which is characterized by deposition of calcispheres within alveoli. We present a case of a 38 years old female who presented with shortness of breath for last 3 years which has exaggerated in last one month. Chest radiograph showed multiple small nodules scattered in bilateral lung fields which were more predominant in lower zone. On HRCT, there were numerous dense, calcific nodules with predominance in subpleural region and basal segments which were forming confluence in basal segments bilaterally. Such advanced changes are rarely described in literature.

Keywords: Microlithiasis, Pulmonary, calcispheres, black pleural line, advanced, SLC34A2, microliths

1. Introduction

Pulmonary alveolar microlithiasis is a rare disease characterized by presence of numerous minute calculi which are called microliths or calcispheres. Most case has been reported in the age group of 20 to 50 years (Charles B Higgins, n.d.). Despite the presence of characteristic radiological features, most patients have no respiratory symptoms at the time of diagnosis. Hence it is also considered an example of clinical and radiological dissociation. The mutation in SLC34A2 gene that encodes a sodium-phosphate co-transporter in alveolar type-2 cells resulting in accumulation of calcium phosphate (Kashyap & Mohapatra, 2013) (Huqun et al., 2007) forming microliths or calcispheres is considered to be the cause of disease.

2. Case Presentation

A 38 years old female presented with history of shortness of breath for last 3 years which has exaggerated for last 1 month. She also had history of intermittent cough. There was no history of fever, expectoration, chest pain, hemoptysis or significant weight loss. She had no family history. She was a non smoker and farmer by occupation. No cyanosis or clubbing was present on examination. On chest auscultation, there were wheezes and coarse crackles bilaterally. Cardiac auscultation was normal. Her blood oxygen saturation while breathing room air was 82%. Her routine hemogram was normal and pulmonary function tests showed mild restriction. Her serum calcium, phosphate and parathormone levels were normal. Her ultrasound examination for abdomen and pelvis was unremarkable.

Chest radiograph (Figure 1) showed innumerable small dense nodules scattered in bilateral lung fields which were predominant in lower zones bilaterally.

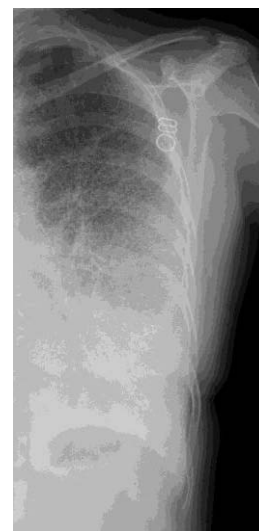


Figure 1: Chest radiograph (PA view) showing innumerable, small, dense nodules scattered in bilateral lung fields, predominant in lower zones. Nodules are forming confluence in lower zones and obscuring mediastinal borders, domes of diaphragm.

These nodules were forming confluence in lower zones obscuring heart border and bilateral domes of diaphragm and costophrenic angles. Even though diaphragmatic borders are obscured, due to marked radiodensity in lower zones, diaphragmatic outline is readily visualised from abdominal soft tissue. Bilateral lower lobe bronchi can be easily appreciated due to surrounding radiodensity and they are also slightly medially deviated. Cardiac shadow was appearing lucent in comparison to lower zones of the lung. Trachea and mainstem bronchi were normal.

High resolution CT showed numerous, small nodules in bilateral lung fields which were predominant in subpleural (figure 2) regions (along costal and mediastinal pleura) and in basal segments of bilateral lower lobes.

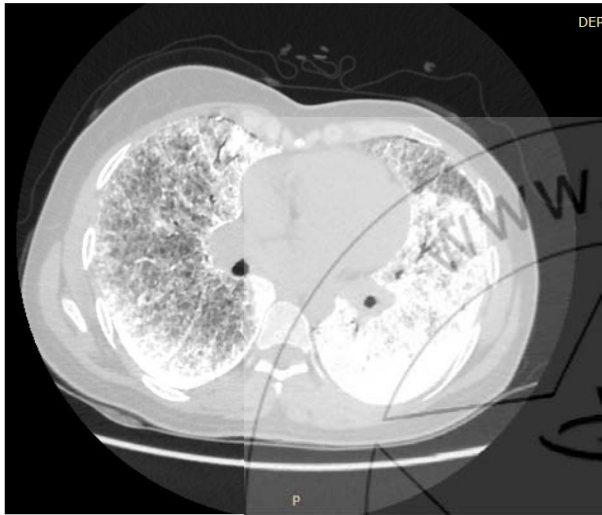


A



P

B



A



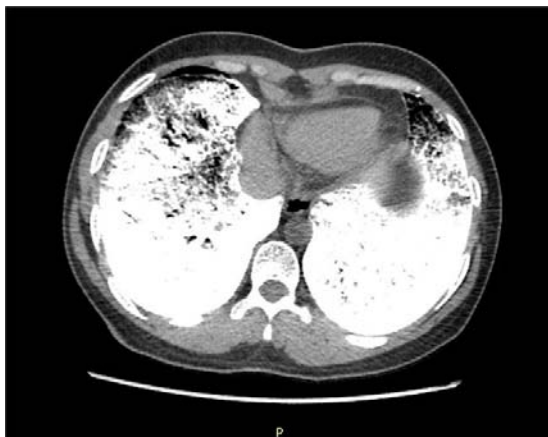
C



D

Figure 2: subpleural calcification . A: Mediastinal window
 B:Lung window at the same level of A. Black pleural line is visible anteriorly.

Nodules were forming confluence in bilateral basal segments with CT value of 350-450 HU (Figure 3). Ground glass haze was seen in bilateral lung fields. Inter and intralobular septal thickening were seen in bilateral lung fields more so along the upper lobes. These patterns of septal thickening and ground glass haze were giving “crazy paving” appearance. Subpleural cystic areas representing emphysematous changes were seen along anterior subcostal pleura. This stripe of relative hypodensity is called “Black pleural line”.



A

Figure 3: Confluent calcification in Pulmonary Alveolar Microlithiasis A: Axial (mediastinal window) showing confluent lung calcification in basal segments. B: Lung window at the same level of A. C: Coronal section (Mediastinal window). D: Sagittal section (mediastinal window) showing confluent calcification in posterior basal segments.

3. Discussion

First case of pulmonary alveolar microlithiasis was described by Friedrich in 1856 and then by Harbitz in 1918. It is considered to be an autosomal recessive disease (Gayathri Devi, Mohan Rao, Prathima, & Das, 2011). No gender predominance has been reported (Sigari & Nikkhoo, 2014). On lung biopsy there is presence of intraalveolar lamellar microliths that are rich in calcium and phosphate (Kashyap & Mohapatra, 2013). Most cases are diagnosed incidentally on chest radiograph and on pulmonary function test they show normal or mild restriction (Jönsson, Simonsen, Hilberg, & Bendstrup, 2012).

Pulmonary alveolar microlithiasis occurs due to defect in SLC34A2 gene which is only phosphate transporter highly expressed in type II alveolar cells in lungs. Outdated surfactant is taken up by type II alveolar cells and macrophages for degradation and recycling. Degradation of phospholipids of surfactant produces phosphates which have to be cleared from alveolar space. But in pulmonary alveolar microlithiasis, due to defect in SLC34A2 gene clearance of phosphates from alveolar cells is impaired leading to formation of microliths (Huqun et al., 2007).

On chest radiograph there are numerous nodules representing microliths seen scattered in bilateral lung fields having predominance in lower zones. Sometimes, cardiac shadow may be seen slightly translucent as compared to surrounding lung field. Black subpleural line may be seen at the pleural surface which is considered as small areas of subpleural emphysema (Ahmad et al., 2013).

On HRCT, most common finding is ground glass opacity and subpleural linear calcification which is present in 90% cases (Marchiori et al., 2007). Other characteristic findings are presence of small, dense nodules which may undergo confluence and are more prominent in subpleural region, posterior and inferior part of lung field (Cluzel, Grenier, Bernadac, Laurent, & Picard, 1991). These high resolution CT findings are pathognomonic of disease (Chang, Yang, Luh, Tsang, & Su, 1999) (Korn, Schurawitzki, Klepetko, & Burghuber, 1992). Microliths of size less than 1 mm produce ground glass haze. Intra and interlobular septal thickening along with ground glass haze produce "crazy paving" pattern.

Multifocal lung calcifications associated with lung nodules are seen in amyloidosis, tuberculosis, sarcoidosis, silicosis, coal worker pneumoconiosis, metastatic calcification and talcosis. Hence they can be kept as differentials for pulmonary alveolar microlithiasis (Ferreira Francisco, Pereira e Silva, Hochhegger, Zanetti, & Marchiori, 2013).

No treatment is available except for lung transplantation (Deniz, 2005). However progression of disease is slow and mostly death occur from respiratory failure due to cor pulmonale (Abdalla et al., 2010).

4. Conclusion

In conclusion, pulmonary alveolar microlithiasis is a rare disease in which radiological features precede clinical

presentation. Hence onus to diagnose lies more on radiologists. Characteristic findings of high resolution computed tomography are diagnostic of pulmonary alveolar microlithiasis. As the disease advances, lungs are filled up with "sand" (deposition of calcific nodules), patient succumbs to death. Authors thought this disease as analogous to a "sand clock".

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