Review Article

Pneumothorax in sarcoidosis

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Abstract: While sarcoidosis is a relatively common but often underdiagnosed disease, pneumothorax appears to be a rare clinical event observed mostly at the late stages of the disease course. The precise underlying mechanism of such complication is unclear and probably involves the formation of bullae due to bronchial obstruction and retraction-collapse of distracted lung tissue. Thoracoscopic bullectomy represent the preferred treatment option for recurrent pneumothoraces. The administration of corticosteroids for the treatment of pulmonary sarcoidosis may have a protecting effect for such recurrences, but remains a controversial issue.

Keywords: Sarcoidosis; pneumothorax; medical thoracoscopy

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Sarcoidosis is a relatively common inflammatory disease of unknown etiology, characterized by the formation of noncaseating granulomas (1). It affects all races and ethnic groups although significant differences both in incidence and in phenotype have been detected across the world (2). Sarcoidosis is considered to be a "great mimic" since it presents with an intriguing diversity of manifestations from literally all organs and systems. Despite this strong heterogeneity pulmonary manifestations typically predominate and abnormalities on chest radiographs are observed in approximately 90% of patients. In addition thoracic involvement accounts for most of the morbidity and mortality associated with the disease (3). The most characteristic radiologic findings are bilateral hilar lymphadenopathy and lung parenchymal infiltrates including reticular, reticulonodular and focal alveolar opacities (4). About 25% of patients exhibit atypical manifastations such as cavities, pleural effusion, solitary pulmonary nodules, mycetomas, bullae and pneumothorax (5,6).

Bullae in sarcoidosis are considered different from the localized cystic airspaces which are often seen in stage IV disease, since they are larger and usually represent the cause of pulmonary function loss (7). The precise mechanism leading to bullae formation in sarcoidosis remains unclear. However, three distinct explanations have been proposed; (I) obstruction of bronchi or bronchioles due to endobronchial involvement, resulting in peripheral air trapping, distention and rupture, particularly during exercise of coughing (7-10). Nevertheless endobronchial involvement has not been detected in all cases where bronchial biopsy was performed (10); (II) retraction and collapse of surrounding pulmonary parenchyma leading to bullae formation. Granulomatous inflammation may lead to lung contraction and subsequent adjacent airspace enlargement (11); (III) tissue destruction

due to inflammatory alveolitis through by a variety of inflammatory mediators (11,12). It is also possible that all three mechanisms may participate in bullae formation (11).

The etiology of pneumothorax in sarcoidosis involves rupture of subpleural bullae or necrosis of subpleural granulomas (13). Pneumothorax occurs in 2% of patients with sarcoidosis and only few cases have been reported in the literature (11-15). Haemothorax or pleural effusion may coexist (16,17). Pneumothorax may present on both sides and different series have reported left (15) or right (12) predominance. Recurrent or bilateral pneumothorax seems to be common (16,18). Many authors have suggested that pneumothorax is usually observed as a complication of fibrosis or bullous disease late in the course of sarcoidosis (19-21). However pneumothorax can also be the presenting manifestation of the disease or occur as the first evidence of relapse (11,13-15).

The first case of bullous form of the sarcoidosis was presented by Zimmerman and Mann in 1949 (22). Bullous changes have been usually reported within 3-4 years of symptom presentation (12). Based on few published series, the age at diagnosis of bullous sarcoidosis ranges from 21 to 67 years (12) and no ethnic predominance was noted. The majority of patients present with an obstructive disorder in lung function which may be particularly severe (11). However, restrictive pattern and normal spirometry have also been reported (8,12,22,23). Bullae may involve the upper or lower lung zones equally (12).

Although both pneumothorax and bullous changes are considered to be rare manifestations of sarcoidosis it is conceivable that in fact they represent under-recognized forms of the disease. Due to nonspecific symptoms the diagnosis of sarcoidosis may not be suspected and symptoms may be attributed to bronchial asthma or COPD (11,12). This is particularly true in smokers with upper lobe bullae. In addition granulomatous lesions may not be noted along the walls of resected bullae, rendering biopsy of relatively spread lung tissue necessary in order to establish the diagnosis (12).

Keller *et al*. in their histopathological review have concluded that 37% of patients who underwent volume reduction surgery for emphysema presented with unsuspected findings such as fibrosis, granulomatosis, inflammation and neoplasia (24). More specifically noncaseating granulomatous changes were observed in 9 out of 80 cases and although mediastinal lymphadenopathy was noted in the majority of these cases, clinical characteristics of sarcoidosis were not present. Patients with another histopathological diagnosis in addition to emphysema had a more complicated recovery after surgery in spite of similar radiologic and pulmonary function test preoperatively (24). Given the rarity of bullous sarcoidosis and the possibility of under-diagnosis a prospective study on the cases referred for bullectomy may be useful.

Treatment for pulmonary sarcoidosis remains controversial although most authors agree that corticosteroids are indicated when severe functional impairment exists at presentation or significant deterioration is observed during the course of the disease (25). The management of pneumothorax is even less clarified. Sharma suggested that early steroid treatment may be beneficial in pneumothorax relapse (19). In a more recent report a recurrence of pneumothorax was noted after discontinuation of prednisone (15). On the contrary Froudarakis *et al*. did not observe recurrence of pneumothorax in patients without treatment and concluded that steroids may be useful in patients with functional impairment (13). In this setting it seems reasonable to treat with corticosteroids in case of parenchymal abnormalities combined with loss in pulmonary function.

In pneumothorax complicating sarcoidosis, thoracoscopic bullectomy has been performed in case of recurrent pneumothorax (15) or when tube drainage was proved to be unsuccessful (14). Bullectomies have also been reported in cases of bullous sarcoidosis (9) since these patients may not respond to steroid treatment and rapidly progress to respiratory failure (11,12). The complication rate is higher in patient exhibiting underlying lung disease (24) and caution should be used in order to assure that the thoracic cavity (11,26-35) is filled with lung tissue after surgery (36-47).

In conclusion sarcoidosis is often under-recognized as a cause of recurrent spontaneous pneumothorax or bullae. Clinical clues that may help in this direction include young age, limited smoking history with severe obstruction and evidence of pulmonary or extrapulmonary sarcoidosis.

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