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HIGH-RESOLUTION CT CHEST FINDINGS IN RARE OCCUPATIONAL LUNG DISEASES – AN OVERVIEW

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ABSTRACT

CT has an increasing role in the radiologic evaluation of occupational/ environmental lung disease. The high-resolution CT (HRCT) findings of siderosis, talcosis, berylliosis, calcicosis and hypersensitivity pneumonitis are described. The purpose of this article is to describe the high-resolution CT (HRCT) features of rare occupational lung diseases. The HRCT chest was done from June 2012 to June 2013 in 50 patients with occupational history related to the following diseases with a minimum of 5 years of occupational exposure with symptoms of cough with/ without sputum. No standardized quantification scheme is available for occupational lung diseases using CT.

KEYWORDS：Occupational Lung Disease , HRCT Chest , Siderosis, talcosis

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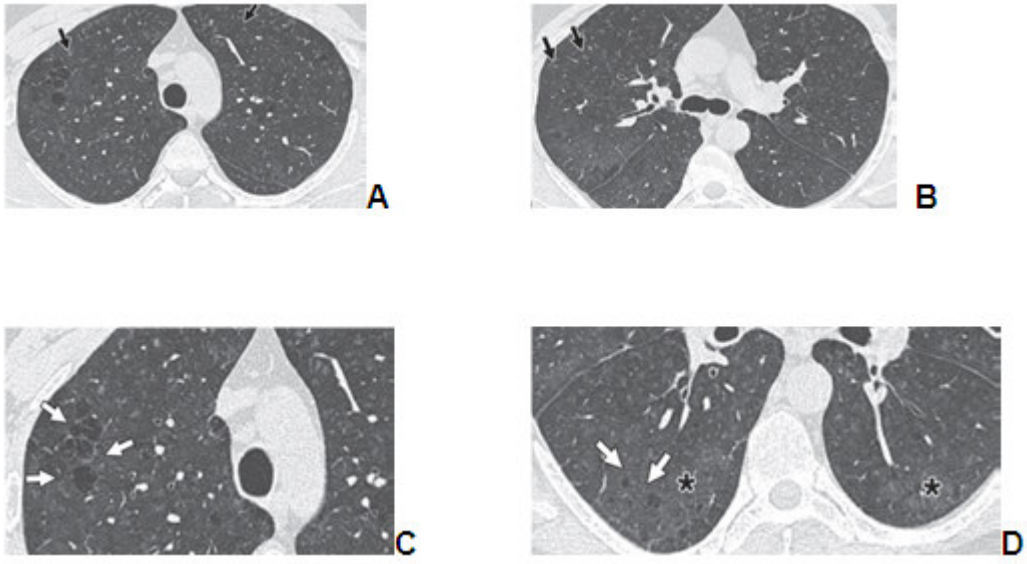
INTRODUCTION

The term interstitial lung disease (ILD) comprises more than 210 separate disease entities, each having its separate and often unique radiological manifestations. Because the clinical presentation of most of these diseases is similar, high-resolution computed tomography (HRCT) becomes a valuable tool in narrowing the differential diagnosis.The importance of HRCT is further underlined by the fact that there is no gold-standard diagnostic test for ILD. The purpose of this article is to describe and illustrate the HRCT features of patients with rare occupational lung diseases.

DISCUSSION

SIDEROSIS

Siderosis is caused by the accumulation of iron oxide in macrophages within the lung [1]. Siderosis is not usually associated with fibrosis or functional impairment [1, 2, 4]. The radiologic abnormalities are reversible and may resolve partially or completely after exposure ceases [2, 3].HRCT shows widespread ill-defined small centrilobular nodules and, less commonly, patchy areas of ground-glass attenuation without zonal predominance [1, 2] . Emphysema is often seen [1]. The micronodules on CT correspond to dust macules, which are collections of dust-laden macrophages aggregated along the perivascular and peribronchial lymphatic vessels [1].Inhaled iron with silica results in silicosiderosis (mixed-dust pneumoconiosis) [1, 2] . Silicosiderosis is seen in individuals involved in the mining and processing of iron ores, workers in iron and steel rolling mills, and foundry workers.

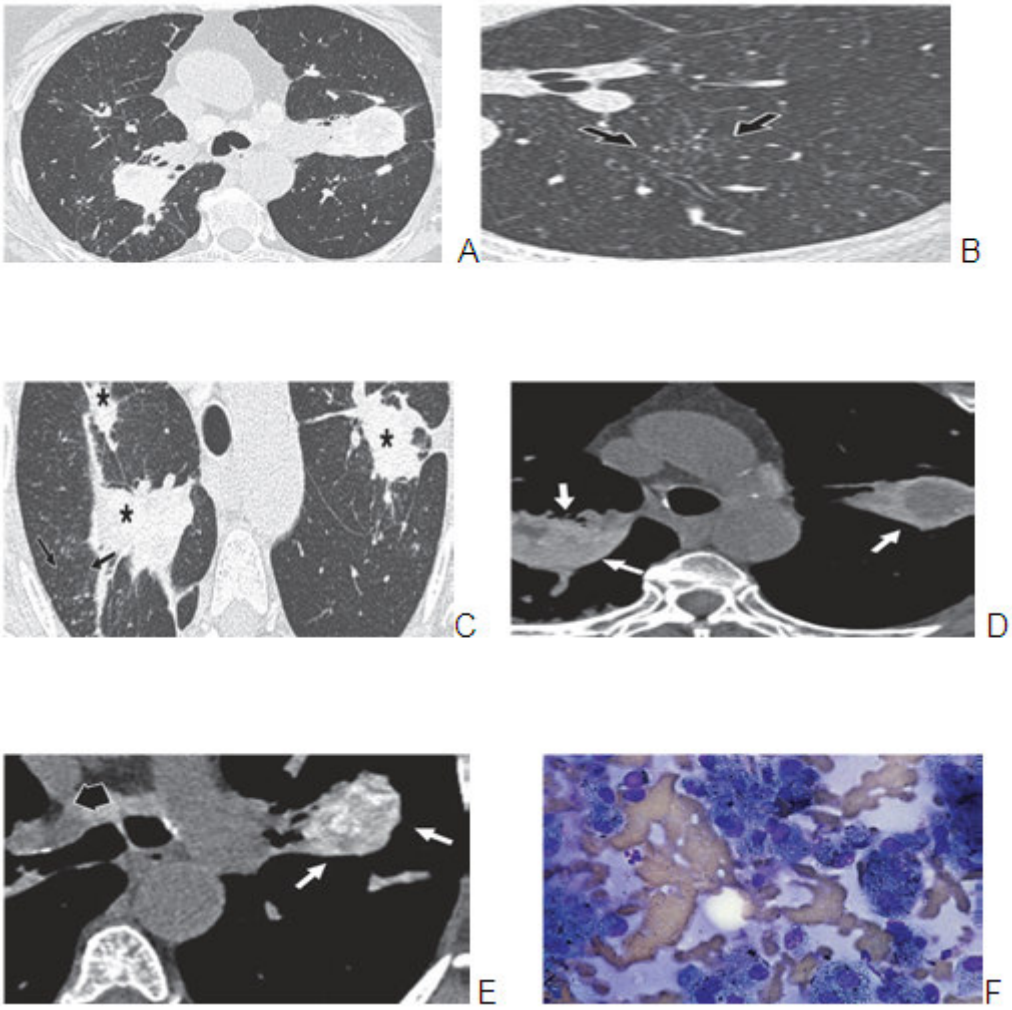


Siderosis in 45-year-old man with 10 pack-year smoking history and 25 years of exposure to arc-welding who presented complaining of cough.

A–D, High-resolution CT images (1-mm-thick sections) show multiple small and poorly defined centrilobular nodules in upper lobe of both lungs (*black arrows*, A and B). Centrilobular emphysema (*white arrows*, C and D) and areas of ground-glass attenuation (*asterisks*, D) in dependent zones are seen. Results of pulmonary function test were normal.

TALCOSIS

It is a hydrated magnesium silicate used in the paper, plastics, rubber, building, paint, and cosmetic industries [1]. Exposure occur as a result of inhalation or by IV administration [1]. Talc causes a nonnecrotizing granulomatous inflammation that leads to progressive fibrosis [1, 5]. HRCT findings in patients with talcosis caused by inhaled particulates include small centrilobular and subpleural nodules and heterogeneous conglomerate masses with internal foci of high attenuation that correspond to talc deposition [1, 5, 6]

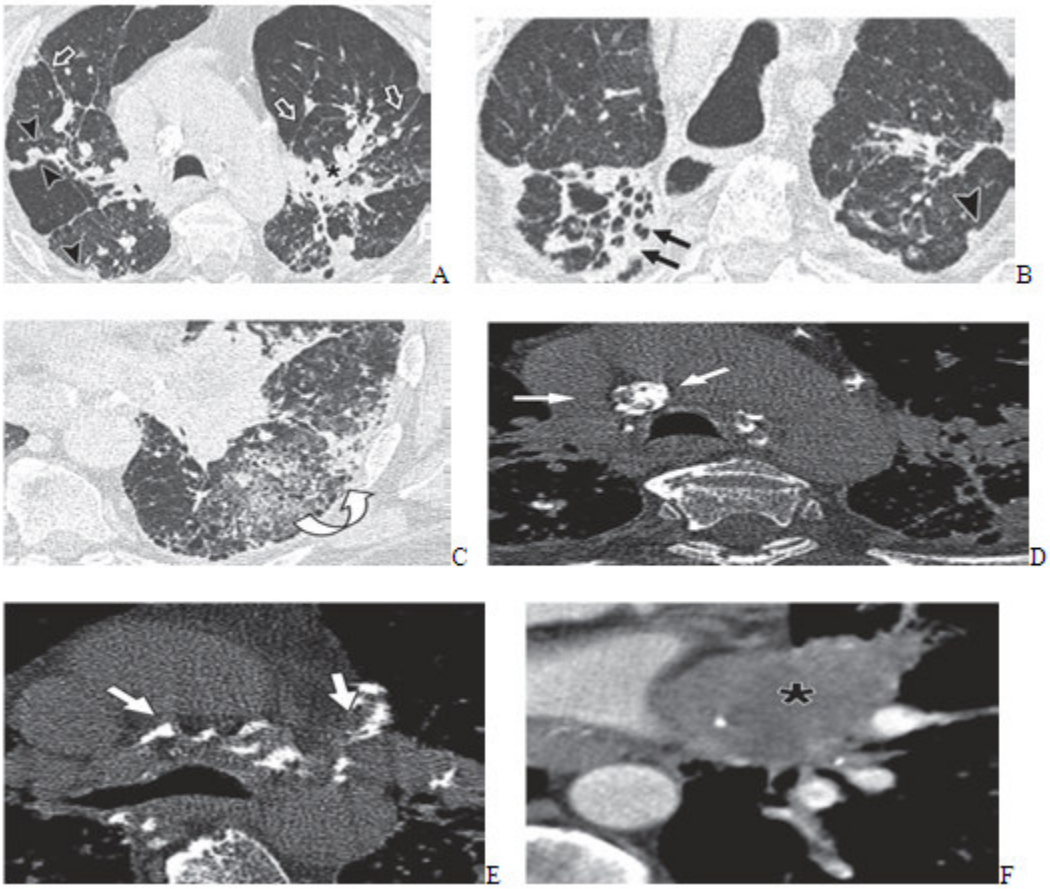


Talcosis in 65-year-old man who worked for 5 years in magnesium silicate processing.

A–E, High-resolution CT images (A–C) show small centrilobular nodules (*black arrows*, B and C) and conglomerated masses (*asterisks*, C) in upper lobes. When viewed at mediastinal windows (level, 10 HU; width, 300 HU) (D and E), masses are seen to contain high-attenuation material (*white arrows*), also seen in mediastinal lymph nodes (*black arrow,* E).F, Photomicrograph after lung fine-needle aspiration biopsy shows talc crystals in cytoplasm of alveolar macrophages, pathologic confirmation of talcosis.

BERYLLIOSIS

Exposure to beryllium occurs in aerospace, ceramics, dentistry and dental supplies, nuclear weapons and reactors[7]. There are two distinct types of lung injury related to beryllium exposure: an acute chemical pneumonitis and a chronic granulomatous disease [7]. Acute berylliosis has become rare [1]. Chronic beryllium disease represents a granulomatous hypersensitivity response. It has been associated with pulmonary carcinoma [1]. A diagnosis of chronic beryllium disease requires a lung biopsy proving granulomatous inflammation and evidence of sensitivity to beryllium shown at blood testing or in bronchoalveolar lavage fluid [1, 7]. HRCT findings are parenchymal small nodules [1] often clustered around the bronchi, interlobular septa, or in the subpleural region where the nodules may form pseudoplaques [7] and interlobular septal thickening [1, 7],ground-glass opacities, honeycombing, conglomerate mass, bronchial wall thickening [7], and hilar or mediastinal lymph nodes with amorphous or eggshell calcification [7]

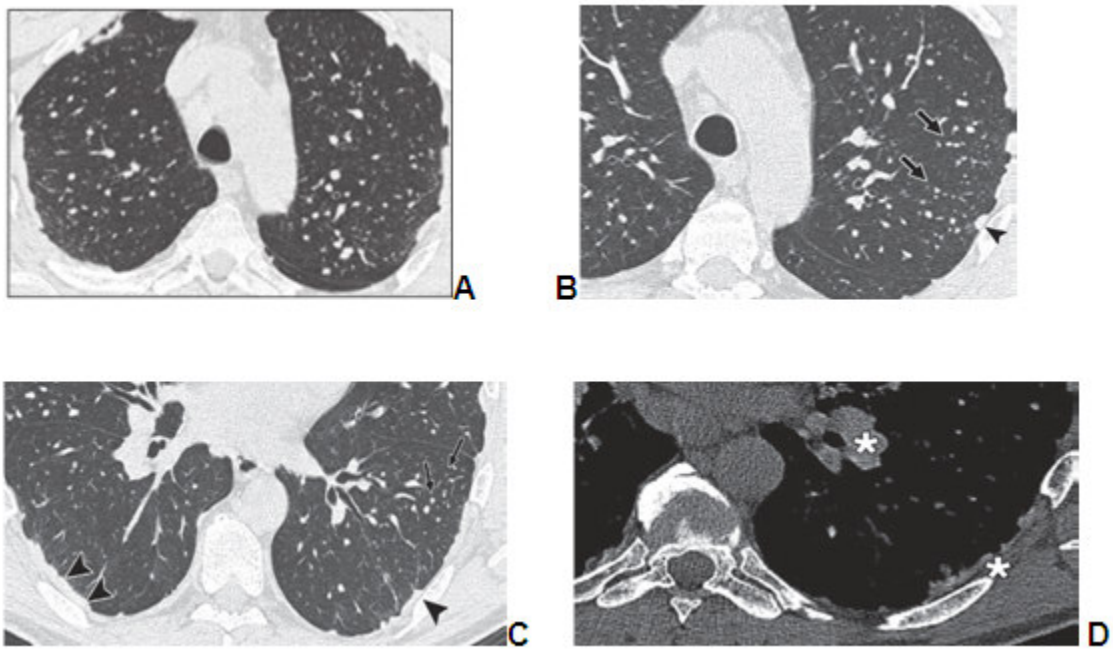


46-year-old man, who worked with dental supplies for 18 years, with advanced chronic beryllium disease.

A–F, High-resolution CT images show multiple small nodules (*arrowheads*, A), predominantly subpleural and conglomerate masses (*asterisk*, A and F) associated with interlobular septal thickening (*open arrows*, A), marked distortion and dilation of segmental bronchi (*black arrows*, B), and upper lobe volume loss. Ground-glass attenuation with reticulation and honeycombing (*curved arrow*, C),hilar and mediastinal lymph nodes with eggshell calcification (*white arrows*, D and E),and left hilar mass (*asterisk*, F) with invasion of left inferior pulmonary vein.

CALCICOSIS

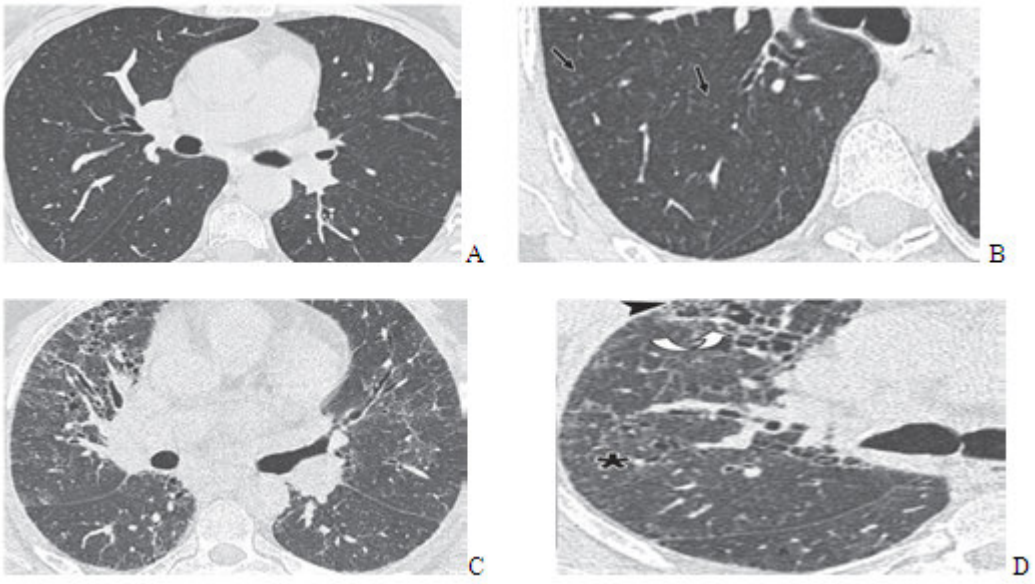
Calcicosis is caused by inhaling limestone dust. Pure limestone itself does not cause pneumoconiosis [8, 9]. The nodules show a foreign-body granulomatous response with several foreign-body cells. Light microscopy reveals the presence of numerous birefringent crystals with a chemical composition consistent with limestone .HRCT findings are presence of widespread small nodules [8].



Calcicosis in 45-year-old man who was marble worker for 16 years.A–D, High-resolution CT images (A–C)show small diffuse nodules (*arrows*,B and C) and somesubpleural compounding pseudoplaques(*arrowheads*, B and C).Mediastinal window CT image (level, 15 HU; width, 350 HU) (D) shows pseudoplaques and mediastinal lymph nodes withhigh attenuation and punctate calcifications (*asterisks*, D)

HYPERSENSITIVITY PNEUMONITIS

Hypersensitivity pneumonitis, is a worldwide immunologic occupational lung disease. Humoral (type III) and cell-mediated (type IV) immune responses play a role in pathogenesis, resulting in alveolitis and granuloma formation [2, 10]. Although isocyanates are not organic dusts, the hypersensitivity pneumonitis they cause is identical to organic dust–related hypersensitivity pneumonitis [2] .The characteristic HRCT manifestations in acute hypersensitivity pneumonitis consist of air-space consolidations [2, 10]. Findings in subacute hypersensitivity pneumonitis are patchy areas of ground-glass attenuation and small centrilobular nodules [2, 11] (Fig. A). Other findings are focal air trapping on expiratory scans and cystic spaces presumably caused by partial bronchiolar obstruction [10, 11]. Chronic hypersensitivity pneumonitis is characterized by the presence of fibrosis superimposed on findings of acute or subacute hypersensitivity pneumonitis [2, 10, 11] (Fig. B). Relative sparing of the lung bases usually allows its distinction from idiopathic pulmonary fibrosis [2, 10].



Hypersensitivity pneumonitis due to occupational exposure to isocyanates

A and B, High-resolution CT images show widespread small centrilobular nodules (*arrows*, B) in 45-year-old woman who was furniture polisher. Findings show subacute phase of hypersensitivity pneumonitis. C–D, High-resolution CT images show findings of fibrosis predominantly in upper lobes.

RESULTS

In the presence of a history of exposure and consistent clinical features, the diagnosis of an uncommon occupational lung disease can be suggested by the characteristic described HRCT findings. We present 50 cases of unusual occupational lung diseases and their HRCT findings. The diseases studied were siderosis, talcosis, berylliosis, calcicosis and hypersensitivity pneumonitis .

CONCLUSION

Occupational lung diseases represent a frequently diagnosed work related condition. High-resolution CT (HRCT) is fundamental for the quantification of disease severity and the prognosis and entification of coexisting or alternative diseases. However, no standardized quantification scheme is available for occupational lung diseases using CT.The aim of this article is to describe and illustrate the HRCT features of patients with rare occupational lung diseases.

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