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CASE STUDY

Apparent Crazy Paving "Pulmonary Alveolar Proteinosis versus Hypersensitivity Pneumonitis"

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ABSTRACT

Interstitial lung disease (ILD) is an umbrella term for a large group of chronic disorders that involve the entire lung parenchyma as well as the alveolar interstitium. Fibrosis of the alveolar interstitium is a process common to all ILDs. It can be considered as a sequela of chronic alveolitis that produces a derangement of the alveolar structures and ultimately leads to loss of functional gas exchange units. Fibrosis may progressively cause lung stiffness, reducing the ability of the air sacs to capture and carry oxygen into the bloodstream and eventually lead to permanent loss of ability to breathe. It ultimately culminates in "end-stage lung disease". ILD can be caused by exposure to hazardous chemicals, certain medications, and medical treatments. Diagnosis of ILDs is done by evaluation of patient through chest radiograph and high-resolution computed tomography (HRCT) features. At present, open or thoracic lung biopsy is gold standard for the diagnosis of ILDs. The "crazy-paving" pattern is a common finding nowadays at HRCT of lungs. It consists of diffuse ground-glass attenuation with superimposed interlobular septal thickening and intralobular lines resembling the structure of irregularly shaped paving stones. Crazy pavement in HRCT thorax is seen most commonly in acute respiratory distress syndrome, bacterial pneumonia, acute interstitial pneumonia and pulmonary alveolar proteinosis. Less common causes are drug-induced pneumonitis, radiation pneumonitis, pulmonary hemorrhage, chronic eosinophilic pneumonia, UIP, and pulmonary edema. We herein present a case of ILD with interesting HRCT pattern of crazy pavement pattern.

Keywords: Alveolitis, crazy paving pattern, hypersensitivity pneumonitis, interstitial lung disease, lung biopsy, pulmonary alveolar proteinosis

INTRODUCTION

Interstitial lung disease (ILD) is a heterogenous group of disorder that has similar clinical, roentgenographic, and physiologic features. The histopathology is characterized by an alveolitis and alveolar septal fibrosis. The current concept is that connective tissue alteration is preceded and caused by alveolitis. Although lung biopsy is the standard for assessing the severity of alveolitis, computer tomography and pulmonary function testing can be useful in some diseases.[1,2] Little epidemiologic data are available on the occurrence of ILD in the general population. To describe the prevalence and incidence of ILD, a population-based registry of patient with ILD was established in Mexico. Overall, the prevalence of ILD was 20% higher in males than in females.[3,4] More than hundred agents are known to cause ILD, but in two-thirds of all cases, no cause can be found. This group commonly referred to as ILD of

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unknown cause.[5] The histologic diagnosis used in adult may represent different disease process in children. For example, case of desquamative interstitial pneumonitis reported in infants is often more severe and refractory to treatment than those reported in adults.[6] Hypersensitivity pneumonitis (HP) is divided based on clinical symptoms into acute, subacute, and chronic stages. Most biopsy is taken from patient in subacute stage usually peribronchiolar in which there is relatively mild chronic interstitial inflammatory infiltrate, accompanied in most cases by poorly formed interstitial granulomas or isolated giant cells. However, the pathologic feature in the chronic that is fibrotic stage is poorly defined in literature. The features are important to recognize because the chronic stage of HP is often associated with a poor prognosis. Data available where prolonged exposure to the sensitized antigen over a period of time results in hypersensitive pneumonitis. Three patterns of fibrosis are seen (a) predominantly peripheral fibrosis in a patchy pattern with architectural distortion and fibroblast foci resembling microscopically usual interstitial pneumonia (UIP), (b) irregular predominantly peribronchiolar fibrosis, (c) relatively homogenous linear fibrosis resembling fibrotic non-specific interstitial pneumonia (NSIP); and high resolution computed tomography (HRCT) shows variable pattern ranging from severe fibrosis, in some instances with an upper zone predominance to predominantly ground glass opacities with peripheral reticulation. Chronic HP may mimic UIP or fibrotic NSIP. The presence of isolated giant cells, poorly formed granulomas, or Schaumann bodies is crucial to arriving at the inerrant diagnosis if no areas of subacute HP are evident.[7] Crazy paving on HRCT refers to the appearance of ground-glass opacity with superimposed interlobular and intralobular septal thickening. It is non-specific finding that can be seen in a number of conditions such as acute respiratory distress syndrome (ARDS), acute interstitial pneumonia, and pulmonary alveolar proteinosis (PAP) rarely. Here, we present this unusual HRCT finding in a patient with ILD.

CASE REPORT

A 52-year-old female, non-addict, housewife, symptomatic for 1 year, presented to the outpatient department with a complaint of predominantly dry cough not associated with expectoration and progressive shortness of breath of MMRC grade 1–2 since 2 months increased to MMRC grade 3 since 2 weeks. She had no complaints of fever/chest pain/orthopnea/paroxysmal nocturnal dyspnea. There were no signs of right heart failure. There was a history of exacerbation of symptom 0–1/year. She complained of occasional snoring with no complaint of excessive daytime sleepiness/early morning headache/irritability/non-refreshing sleep/near-miss accident. There is no history of atopy in self or family. There was no history of seasonal variation of symptom. She had no complaints of multiple small and large joint pain. There was no history of organic and inorganic dust exposure. There was no history of long-term drug intake. There was no past history of tuberculosis/antitubercular drug intake/tuberculosis contact. She had a known case of hypothyroidism on therapy for 3 years. She was a known case of diabetes mellitus on oral hypoglycemic drugs. She was evaluated with chest roentgenogram suggestive of (s/o) bilateral reticulonodular changes [Figure 1]. On general examination, there was grade 2 clubbing. There was no pallor/icterus/cyanosis/lymphadenopathy. Respiratory system examination revealed bilateral crackles on auscultation. Other system examinations were unremarkable. On 6-min walk test, she completed 520 m and there was a drop in transcutaneous saturation from 95% to 86%. Sleep scores to rule out sleep-disordered breathing revealed mild pre-test probability. She was further evaluated with HRCT thorax [Figure 2] which was suggestive of septal thickening in bilateral upper and lower lobes. Diffuse patchy ground-glass attenuation is seen in both lungs with ill-defined bronchocentric nodule. Patchy lobular air trapping is seen in both the lungs features suggestive of (f/s/o) apparent "crazy paving" with patchy area of geographic ground-glass attenuation and septal thickening. The patient was also evaluated with spirometry which was with clinicoradiological correlation suggestive of restrictive abnormality with FVC of 46% and Indian predicted of 51%. 2-dimensional echocardiography

was suggestive of LVEF of 55% and no pulmonary arterial hypertension. Fiberoptic bronchoscopy was done which did not visualize any gross abnormality. Bronchoalveolar lavage (BAL) and transbronchial lung biopsy were performed from involved segments. BAL was sent for GeneXpert, AFB smear and culture, and Papanicolaou stain (PAP) and Periodic acid–Schiff stain. All were negative. Transbronchial lung biopsy for histopathological examination came to be inconclusive. The patient was started on corticosteroids 1 mg/kg in tapering dose for 6 months.

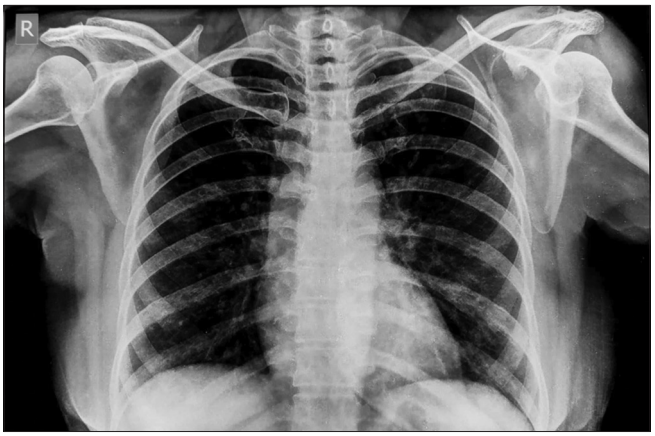

Figure 1: Chest X-ray PA view showing bilateral reticulonodular opacity

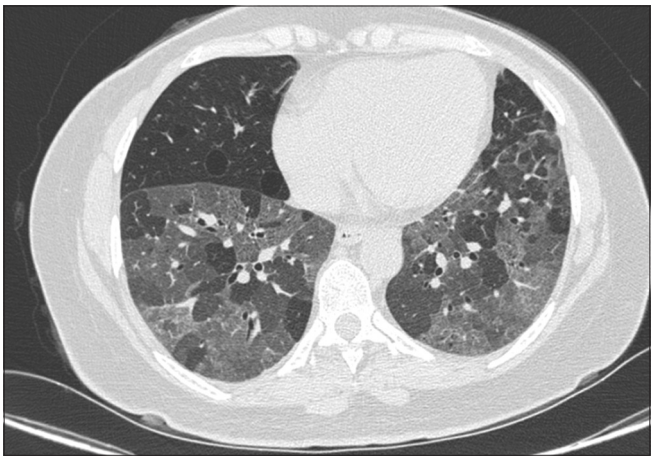

Figure 2: HRCT thorax showing crazy paving

DISCUSSION

ILDs are a large family of disorders characterized by inflammation and/or fibrosis of the area of the lung dedicated to gas exchange. ILDs represent about 20% of lung diseases routinely seen by pulmonologist during their daily activity, and their number, due to improvement of the diagnostic procedure, is increasing. In particular, the large number of clinical, functional, and radiological overlaps among ILDs makes their diagnosis extremely difficult and challenging. For these reasons, a multidisciplinary approach to the diagnosis of ILDs is strongly recommended, representing the best way to improve the diagnostic accuracy of these diseases. Crazy pavement pattern is seen in many conditions such as PAP (pulmonary alveolar proteinosis), ARDS (acute respiratory distress syndrome), cardiogenic pulmonary edema, alveolar haemorrhage, lymphangitic carcinomatosis, chronic eosinophilic pneumonia, pulmonary veno occlusive disease and hypersensitive pneumonitis Crazy pavement pattern on high-resolution computed tomography scan is not so common in ILD. Crazy pavement pattern is described as scattered or diffuse ground-glass attenuation with super-imposed septal thickening and intralobular lines. Knowledge of many causes of this pattern can be useful in preventing diagnostic error. Although crazy paving pattern causes are frequently indistinguishable at radiologic evaluation, difference in location of the characteristic lung attenuation, presence of other radiological findings, patient's history, and clinical presentation can often be useful in suggesting the correct diagnosis.[8] In our case, the patient was evaluated in view of differentiating between PAP and chronic hypersensitive pneumonitis. A phospholipoproteinaceous material is filled in the airspaces in alveolar proteinosis giving a milky appearance of the bronchial washings. On CT, ground-glass appearance is due to the filling of the alveoli. When the airspaces adjacent to the inter and intralobular septa and to the alveolar walls fill, the peri-acinar pattern becomes visible.[9] On staining the BAL fluid, the presence of PAS positive, eosinophilic, granular, acellular material with occasional enlarged foamy macrophages generally establishes the diagnosis. Deposition of PAS positive, eosinophilic material within the alveoli without any architectural distortion is seen in biopsy. Detection of anti-GM-CSF antibodies is an important tool for differentiating autoimmune (idiopathic) forms from other subtypes of PAP with

a high sensitivity and specificity.[10] In HP, antigen-antibody complexes around the microvasculature cause a neutrophil-rich inflammatory response and subsequent tissue injury. Biopsy in the subacute phase shows heavy infiltrates of lymphocytes and plasma cells in the walls of the alveoli in combination with poorly formed granulomas containing foreign body giant cells. In chronic phases, the interstitial inflammation remains, but fibrosis becomes more apparent and honeycombing can occur. On HRCT thorax, the alterations in the walls of the alveoli and the inflammation in the interstitium are visible as interlobular and intralobular septal thickening.[11] Our patient HRCT thorax revealed septal thickening with diffuse patchy geographic ground-glass attenuation in both lungs with the apparent crazy paving pattern but BAL was sterile and transbronchial lung biopsy was inconclusive still the patient had significant response to steroids with clinical improvement.

CONCLUSION

The crazy-paving pattern on CT is a non-specific finding which is characterized by scattered or diffuse areas of ground-glass attenuation with superimposition of a linear pattern. This linear network can be due to interlobular or intralobular septa thickening or the presence of intralobular fibrosis, or it can be due to linear deposition of material within the airspaces. Earlier crazy-paving pattern was pathognomonic sign of PAP. Nowadays, this pattern is seen in several acute and chronic diseases. It can be diagnosed with clinic radiological correlation and confirmed with bronchial washings and histopathological examination.

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