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Clinical and Imaging Findings in 18 Patients with Eosinophilic Pneumonia

Background/Objective: Eosinophilic pneumonia is a rare cause of lung disease in adulthood. The relatively non-specific clinical presentations of this disease process make the diagnosis a unique challenge. Herein, we reported on clinical and radiological manifestations of this rare clinical entity in 18 patients.

Patients and Methods: We retrospectively reviewed the medical records of 18 patients with acute eosinophilic pneumonia in Masih Daneshvari Medical Center. Diagnostic criteria were based on clinical, laboratory and imaging findings.

Results: The most clinical manifestations were cough and weight loss 15 (0.83) followed by dyspnea 13 (0.72). The most frequent imaging findings were diffuse opacities (reticulonodular or alveolar infiltration) in 11 (0.65), consolidation in six (0.33) and ground-glass opacities in four (0.28) patients.

Conclusion: Diffuse rather than peripheral air-space opacities in imaging of a patient presented with dyspnea, cough, sputum, constitutional symptoms and eosinophilia should make us to think about eosinophilic pneumonia as one of differential diagnoses.

Keywords: bronchoalveolar lavage, pulmonary eosinophilia, diagnostic imaging

Introduction

Making correct diagnosis in patients with diffuse lung disease such as eosinophilic pneumonia (EP), is not always easy. There are several reasons for it including, the rarity of these diseases.[1-4] Although the precise incidence rates of these diseases are unknown, the incidence is less than one case per 1,000,000 population per year.[5] Primary or idiopathic EP includes acute eosinophilic pneumonia (AEP) and chronic eosinophilic pneumonia (CEP). Secondary EP includes drug- and parasite-induced lung diseases.[5]

Patients usually presented with an acute febrile illness, severe hypoxemia, diffuse bilateral infiltrations on chest radiograph, an increased number of eosinophils (mean±SD: 42%±4.8%) in bronchoalveolar lavage fluid, and absence of infection and previous atopic illness.[6,7] This disease can occur not only in adults but also in children.[8]

Bilateral areas of air-space opacity, interlobular septal thickening, ground-glass attenuation, bilateral consolidation and pleural effusion are present on computed tomography (CT) and chest roentgenograms (CXR) of patients with EP (Figs. 1-7). [8-10] In addition, pleural effusion is present in these patients. Areas of ground-glass opacity are mostly observed on imaging of these patients; they are bilateral, random and patchy in distribution. Furthermore, these patients may have smooth septal thickening and pleural effusions.[9,10] Clinical and radiological characteristics of acute and chronic forms of EP are completely different.[11,12] Fever, cough, dyspnea, weight loss and night sweating are common symptoms in chronic form. Besides, some patients have Hemoptysis and chest pain.[11]

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Table 1. Clinical findings in 18 patients with eosinophilic pneumonia

Sign & Symptoms	Hemoptysis	Chest pain	Chilling	Night sweating	Fever	Sputum	Dyspnea	Weight loss	Cough
Relative Frquency	0.11	0.22	0.39	0.50	0.50	0.61	0.72	0.83	0.83
No.	2	4	7	9	9	11	13	15	15

Table 2. Imaging findings in 18 patients with eosinophilic pneumonia

Radiologic findings	X-Ray N / Relative Frequency	CT Scan N / Relative Frequency
Infiltration	11/0.65	13/0.76
Consolidation	6/0.35	10/0.59
Ground-glass opacification	4/0.24	10/0.59
Costo-phrenic angle blunting	3/0.18	–

The peripheral blood eosinophilia is frequently observed in these patients.[13]

One of the most important findings in chest X-ray of these patients is patchy consolidation and non-segmental consolidation in mid and upper lung fields (Figure 2) [14,15] Most of these opacities are arranged peripherally opposed to the pleura (Figure 4). The opacities are usually in an apical or axillary location; they are sometimes basal and mimic a loculated effusion.[15]

The diagnosis of EP, because of its rarity and overlap with other diseases such as hypersensitivity pneumonitis or idiopathic interstitial pneumonia is not simple. Herein, we presented our findings with 18 patients with EP.

Patients and Methods

We retrospectively, evaluated the medical records of those suspicious for EP who were admitted to Masih Daneshvari Hospital. Medical records were evaluated for their past medical history, recent occupation, environmental and medical history, history of smoking, any medications, clinical data, CXR, CT, report of broncho-alveolar lavage and any medical treatments given. The inclusion criteria included

1) diagnosis of primary EP based on the clinical criteria; 2) peripheral eosinophilia; 3) lung eosinophils, with >25% eosinophils in broncho-alveolar lavage differential cell count, or presence of eosinophilic pneumonia in lung biopsy; 4) negative ANA, c-ANCA and p-ANCA; 5) absence of exposure to drugs that are known as causes of pulmonary eosinophilia; 6) absence of infections or other known causes of eosinophilic lung disease. The exclusion criteria included 1) history of a recognizable cause of allergens such as drugs and parasitic, bacterial, viral, or fungal infections or metals; 2) the characteristic American College of Rheumatology (ACR) or Lanham criteria for the diagnosis of CSS; 3) purpura or stigmata indicating dermal or systemic involvement.

Results:

A total of 18 (7 female and 11 male) patients were found with the diagnosis of EP. They had a mean (range) age of 36.1 (14–71) years at the time of diagnosis. The most frequent clinical manifestations were cough and weight loss 15 (0.83) and dyspnea 13 (0.72) (Table 1). Ten patients had bilateral wheezing. Seventeen patients had eosinophilia and erythrocyte sedimentation rate (ESR) was elevated in 14 out of 17 patients. Elevated IgG was observed in four of five and increase of IgE in five of six.

In four of 10 patients, the broncho-alveolar lavage fluid showed elevated levels of eosinophils. In two of six patients, trans-bronchial lung biopsy revealed eosinophilic infiltrations.

CXR showed diffuse infiltrations and opacities (reticulonodular or alveolar infiltration) in 11 (0.65), consolidation in six (0.35), ground-glass opacities in four

Table 3. Chest CT scans & X-rays findings in 18 patients with Eosinophilic Pneumonia

Patient No.	CXR	CT Scan
1	Right costo-phrenic angle blunting	GGO in both upper lobes, LLL air trapping and dense infiltration and consolidation in RLL, mild hilar adenopathy
2	Peripheral ground-glass infiltration in LLL	Nodular ground glass opacity in the upper, mid and lingual, bilateral peripheral nodular infiltration esp. in mid-zone and the upper lobes
3	Non-homogenous infiltration in LLL esp. in retrocardiac region	Bilateral patchy alveolar consolidation interstitial GGO esp. in the upper and mid-fields of the lungs
4	Reticular infiltration with fibrosis in the upper lobes, mild apical pleural thickening in RUL	Hilar and para-tracheal adenopathies, GGO in all zones esp. in RLL with changes in the upper lobes esp. peripherals and sub-pleural, right apical cavity
5	Hyper-aerated lung fields and diffused parenchyma nodular calcifications probably because of an old TB granuloma, alveolar consolidation in mid zone and upper lobes on both sides, peripheral non-homogenous infiltration esp. in LUL	Bilateral peripheral interstitial and alveolar infiltration esp. in the upper lobes
6	Patchy ground-glass opacity and peripheral consolidation in LUL and Rt mid-zone	GGO changes in both lower lobes restricted by main fissure and infiltration on the left
7	Right-sided pleural thickening (esp. in right apex), parenchyma and alveolar infiltration	Infiltration of posterior segment of RUL, collapse consolidation in RML, mild right sided pleural thickening
8	Peripheral reticular infiltration, lung homogenousity	Bilateral peripheral and sub-pleural reticulonodular infiltration with GGO and alveolar shadowing esp. in RLL, right para- and pre-tracheal adenopathies, increased septal thickening, patchy apical consolidation
9	Diffused peripheral alveolar consolidation in both upper lobes	Peripheral interstitial and alveolar changes in both lungs esp. in mid-zones and upper lobes, diffused ground-glass and nodular infiltration in the lower lobes, peripheral consolidation
10	Localized ground glass infiltration in left costo-phrenic angle	GGO in RUL, peripheral alveolar consolidation in LLL, nodular infiltration in LUL and adenopathies
11	Diffused bilateral patchy alveolar consolidation	Diffused peripheral bilateral infiltration with GGO esp. in mid and RUL, peripheral consolidation in LLL, para-tracheal lymphadenopathies
12	Ground-glass infiltration and alveolar pattern in the upper lobes esp. bilateral peripheral and apical fields	Bilateral mixed alveolar and interstitial pattern, bilateral peripheral consolidation, peripheral infiltration in upper lobe, RML and upper segment of the lower lobes, bilateral apical pleural thickening
13	Peripheral infiltration in the middle and upper parts of the lungs, right para-tracheal adenopathies, diffused infiltration in LLL	Peripheral infiltration in both lungs esp. in upper and middle lobes, right para-tracheal lymphadenopathies
14	Pleural based lesion in LUL, bilateral consolidation in upper lobe	Patchy area opacities in peripheral parts of the upper lobes
15	n/a	n/a
16	Costo-phrenic angle blunting, peripheral reticular infiltration in RLL	Emphysematous changes in both lungs, architectural distortion and reticular pattern in upper lobes, thin wall cavity in RUL and upper segment of RLL, peripheral infiltrative changes, bilateral mild pleural thickening esp. in the left side, retrotracheal adenopathies
17	Bilateral alveolar infiltration in both lungs	Diffused non-homogenous lobular GGO in lungs, inter-space air trapping and pleural effusion on the right
18	Fine reticular patterns on both upper lobes, mid-zone, hilar and mediastinal adenopathies	Diffused fine bilateral parenchyma nodular infiltration

LLL: Left lower lobe, RUL: Right upper lobe, RLL: Right lower lobe, LUL: Left upper lobe, RML: Right Middle lobe, GGO: Ground-glass opacity

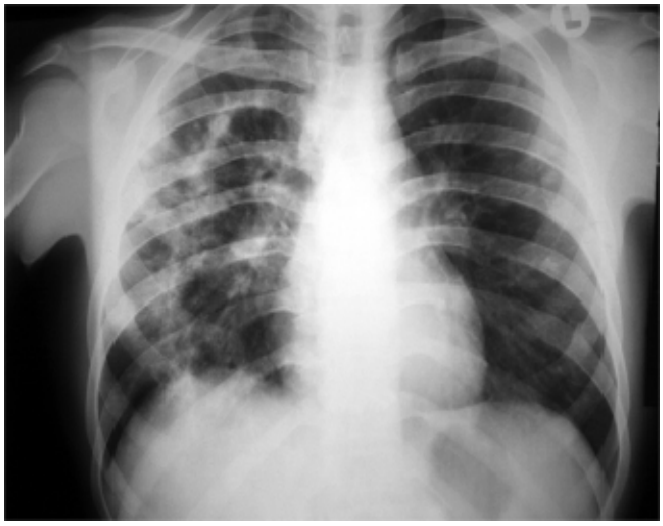

Fig. 1. Non-homogenous peripheral infiltration parallel with chest wall in lower lobes and middle fields of lungs with right para-tracheal adenopathy.

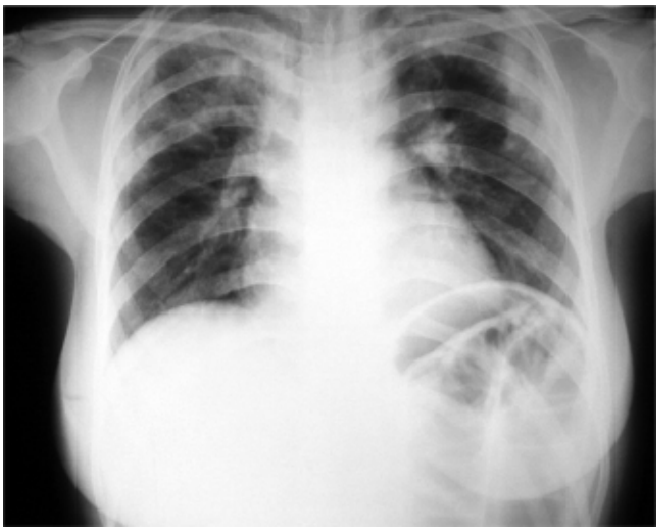

Fig. 2. Upper lobes infiltration and bilateral para-tracheal and hilar adenopathy.

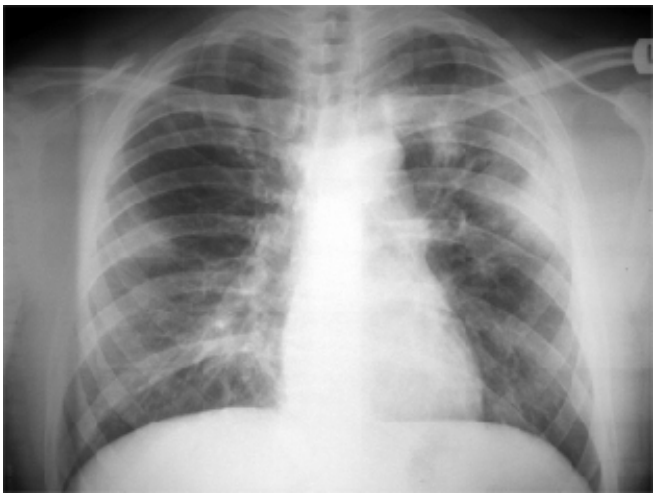

Fig. 3. Peripheral infiltration in upper lobes and right middle lobe. Hilar prominences esp. on the left side.

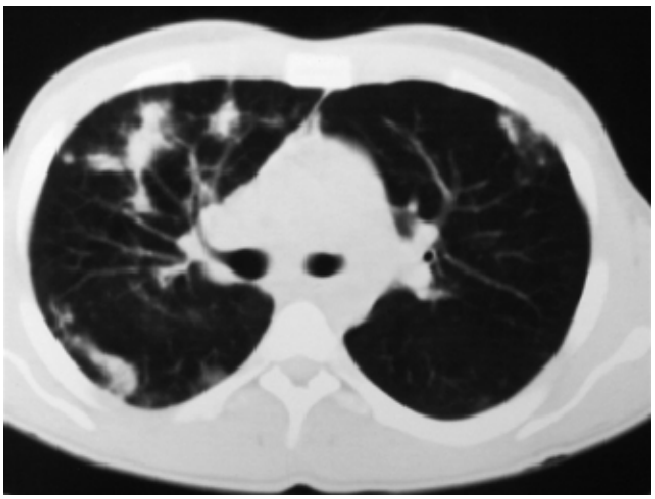

Fig. 4. Peripheral patchy infiltrations on both upper lobes esp. on the right side.

(0.24) and costo-phrenic angle blunting in three (0.18) of 18 patients (Table 2).

In those with pulmonary infiltration, bilateral upper lobe involvements were the most frequent pattern seen in eight and bilateral peripheral involvement in other patients.

In four of six patients with consolidation, involvement was bilateral (0.67)—even upper lobes in two patients; in the remaining two patients, the consolidation involved mid and upper lung lobes—in one patient, the left upper lobe and in another one, the right mid zone was involved.

The most common finding in CT was the ground-glass opacity in 10 (0.59) patients which were bilateral in all of them. In four patients, there were bilateral predominantly involvements of the middle and upper fields of the lungs. In CT, consolidation was reported in nine (0.53) of 17 patients; in two of whom, consolidations were in periphery bilaterally; in two other patients, consolidations were in peripheral parts of the left lower lobe.

Nine patients had consolidations. On 14 (0.82) of 17 CTs, reticulo-alveolar infiltrations were seen. Bilateral peripheral infiltrations especially in the upper lobes in four (0.29), bilateral peripheral infiltrations in mid-zone and upper lobes in three (0.22), and bilateral peripheral infiltrations in three other (0.22) patients were reported. Lymphadenopathy (LAP) was observed in nine (0.50), and pleural thickening in five (0.28) of 18 patients.

Chest CT scans and X-rays findings in 18 patients are summerized in Table 3.

Discussion

Most of our findings were similar to other reports. Similar to previous studies, pulmonary infiltrations, consolidations and ground-glass opacities were prevailed in both CXR and CT.[16-23]

King, *et al*, found bilateral air space opacity in 83% of patients with acute EP.[10] Ebara, *et al*, described 15 CTs and compared their findings on plain CXR and CT in 17 patients with chronic EP. They showed that 11 of 17 patients had peripheral patches or confluent consolidations with or without ground-glass opacities in their CXR. In 16 patients, on the other hand, there were various types of abnormalities with peripheral predominance in CT.[23]

Mayo, *et al*, showed in all of six patients with chronic EP, patchy air-space consolidation which was confined to the upper or mid-zone of the lungs.[14]

In this article, we could highlight three features. Firstly, classification of EP is confusing and it needs further clarification. Secondly, like previous studies, nonspecific findings such as pulmonary infiltration, consolidation, and ground-glass opacity were prevailed both in CXR and CT. Thirdly, the authors pointed out that this disease can present with acute lung injury or acute respiratory distress syndrome, but it is reversible and can be diagnosed by a combination of imaging modalities, particularly high-resolution computed tomography (HRCT), and broncho-alveolar lavage and clinical examination.

Gradually, we were convinced that the pattern recognition (afforded by HRCT) taken concurrent with the cellular patterns of broncho-alveolar lavage, can increase the accuracy of the diagnosis, which may preclude the need for surgical open biopsy. It has been acknowledged that in idiopathic pulmonary fibrosis, in which a coarse peripheral reticular, especially honeycomb pattern associated with lavage neutrophilia with or without eosinophilia, increases the accuracy of the diagnosis to almost 100%; the same could be true for EP.

Although this retrospective study might suffer from all shortcomings of such study method, the data were retrieved from a unique pulmonary referral center in Iran which makes it noticable.

Perhaps, the most important things to be underlined are the significant role of broncho-alveolar lavage

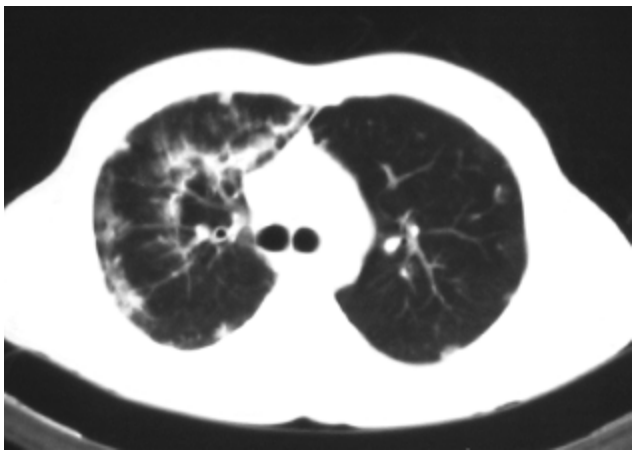

Fig. 5. Non-homogenous bilateral patchy infiltration, especially on the right side. Note typical involvement paralleled with right and mediastinal pleura.

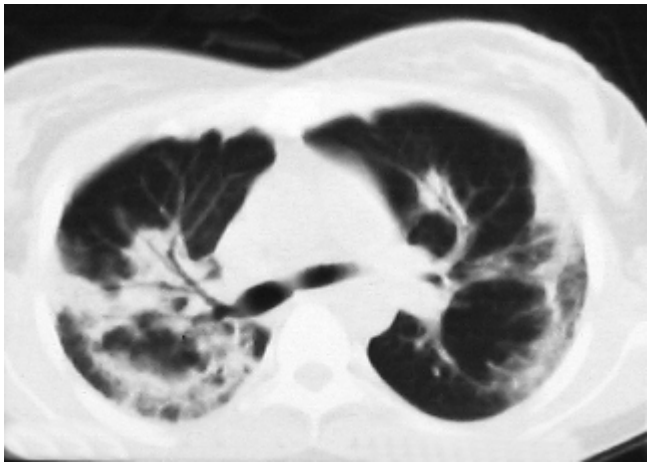

Fig. 6. Bilateral alveolar opacity with typical peripheral involvement paralleled with pleural surface.

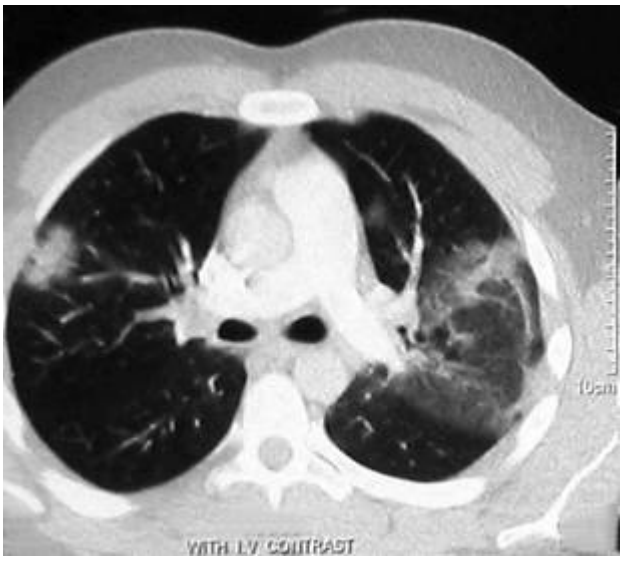

Fig. 7. Peripheral infiltration in the upper lobes with ground-glass pattern and patchy reticular consolidation.

which provides useful information and HRCT which shows us how well we can define the microanatomy of diffuse lung disease, both of which result in added validity of the diagnosis.

Diffuse rather than peripheral air-space opacities in imaging of a patient presented with dyspnea, cough, sputum, constitutional symptoms and eosinophilia should make us to think about eosinophillic pneumonia as one of differential diagnoses.

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