

Evaluation and treatment of the eosinophilic lung diseases in 7 patients

Tugce Uzar¹, Gozde Duyu¹, Adem Dirican², Selda Gunaydin³, Hayriye Bektas Aksoy³, Nazlı Topbası⁴,
Hulya Bayiz⁴, Sevket Ozkaya^{4*}

Abstract

Objective: Eosinophilic lung diseases (ELD) are a rare group of heterogeneous diseases characterized by increase of the eosinophilic ratio in the airways and lung parenchyma. We aimed to present and discuss the clinical, radiologic and pathologic features of six patients with eosinophilic lung diseases.

Conclusion: Peripheral eosinophilia with pulmonary infiltrates is diagnostic clues of eosinophilic lung diseases. Systemic corticosteroids are provided rapid control not only in symptoms but also radiological and clinical improvement of ELD.

Keywords: eosinophilic lung diseases, acute eosinophilic pneumonia, chronic eosinophilic pneumonia

Introduction

Eosinophilic lung diseases are a rare group of heterogeneous diseases characterized by increase of the eosinophilic ratio in the airways and lung parenchyma.(1) They are classified as eosinophilic lung diseases of unknown cause including simple pulmonary eosinophilia, acute eosinophilic pneumonia, chronic eosinophilic pneumonia, idiopathic hypereosinophilic syndrome and eosinophilic lung diseases of known cause; including allergic bronchopulmonary aspergillosis, bronchocentric granulomatosis, parasitic infections, drug reactions, eosinophilic vasculitis (allergic angiitis, granulomatosis (Churg-Strauss syndrome) (2). We aimed to present and discuss the clinical, radiologic and pathologic features of patients with eosinophilic lung diseases.

Material and Methods

We retrospectively evaluated the patients whom diagnosed with eosinophilic lung diseases between January 2013 and January 2018 in the Department of Pulmonary Medicine, VM Medicalpark Samsun Hospital, Samsun, Turkey. The clinical-radiological findings, performed treatments, responses to treatment, and prognoses of patients who diagnosed with eosinophilic lung diseases were retrospectively evaluated. The study was performed in accordance with the ethical principles in the Good Clinical Practice (GCP) guidelines, applicable local regulatory requirements, and the protocol was approved by local ethics review boards. All the patients read the patient information form about the study procedure and written informed consent forms were obtained.

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1 Bahcesehir University, Faculty of Medicine, Medical Student/Intern, Istanbul, TR.

2 Samsun Medicalpark Hospital, Dept of Pulmonary Medicine, Samsun, TR.

3 Giresun University, Faculty of Medicine, Dept of PulmonaryMedicine, Giresun, TR.

4 Bahcesehir University, Faculty of Medicine, Dept of PulmonaryMedicine, Istanbul, TR.

* Corresponding Author: Şevkey Özkaya E-mail: ozkayasevket@yahoo.com Phone: +90 532 474 13 09



Case 1: Atelectasis and respiratory failure due to allergic bronchopulmonary aspergillosis (ABPA) in a patients with severe asthma

A 52-year-old non-smoker female patient was referred to our Intensive Care Unit due to respiratory failure with pulmonary atelectasis, pulmonary mass and consolidations. She was suffering from severe dyspnea due to severe asthma and her asthma had not been controlled with optimal asthma treatment. Chest radiograph showed volume loss with opacity on left hemithorax and consolidations on right hemithorax (Figure 1A). Thoracic CT has indicated to left upper lobe atelectasis, interlobular septal thickening with pulmonary mass and dense consolidations on right lung (Arrow in Figure 1B). Despite suspicion of malignancy, her 3 months prior Thorax CT was better than now (Figure 1C).

We thought that severe asthma, atelectasis and respiratory failure may be caused from Allergic Bronchopulmonary Aspergillosis (ABPA). Laboratory findings revealed that the total IgE level was 2430IU/ml. Aspergillus skin test and sputum culture for Aspergillus species were positive. The systemic corticosteroid treatment was started for diagnosis of “Severe asthma, Atelectasis and Respiratory Failure Due To Allergic Bronchopulmonary Aspergillosis (ABPA)”.

At the 2nd day of treatment atelectasis and pulmonary consolidations were rapidly improved (Figure 1B). Four weeks after the treatment, atelectasis and pulmonary consolidations were recovered and fungal cavitory lesion due to aspergillus was noted on right lung (Arrow in Figure 1D).

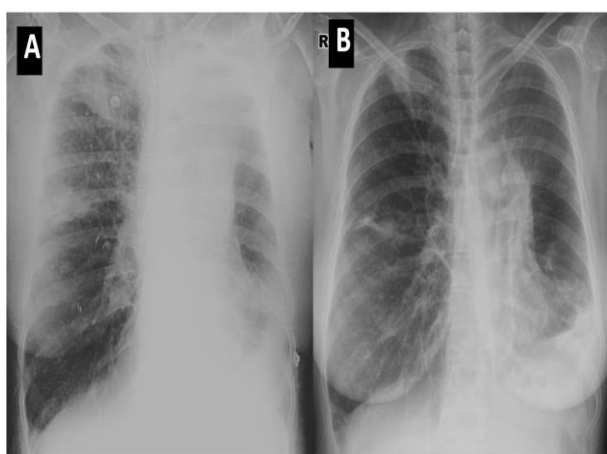


Figure 1A. Chest radiograph showed the volume loss with opacity on left hemithorax and consolidations on right hemithorax (Figure 1AA). The systemic corticosteroid treatment was started and at the 2nd day of treatment atelectasis and pulmonary consolidations were rapidly improved (Figure 1BB).

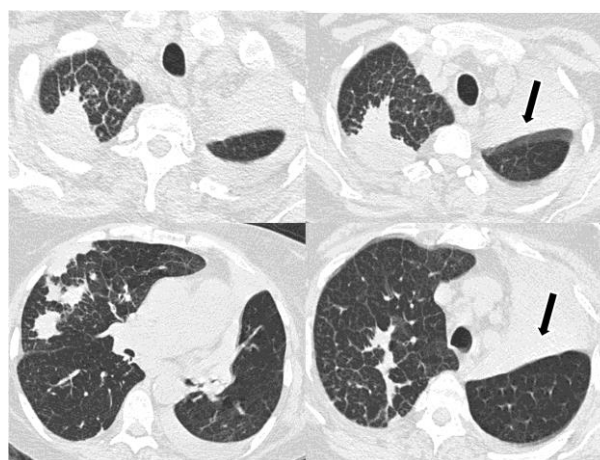


Figure 1B. Thorax CT showed the left upper lobe atelectasis, interlobular septal thickening with pulmonary mass and dense consolidations on right lung.

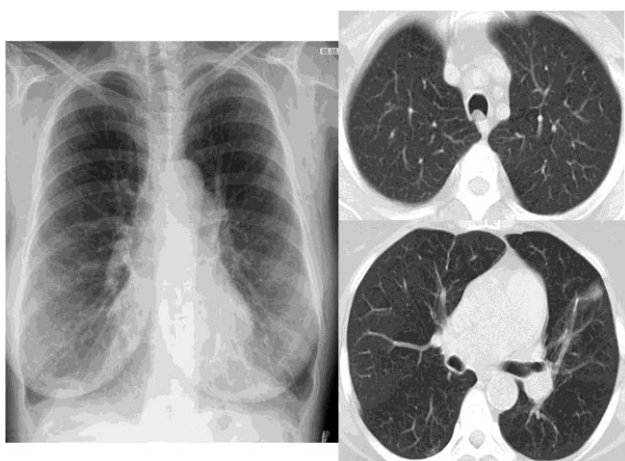


Figure 1C. Three months prior Thoracic CT findings of patient was were better than now. Due to this data, the malignancy probability removed from possibilities.

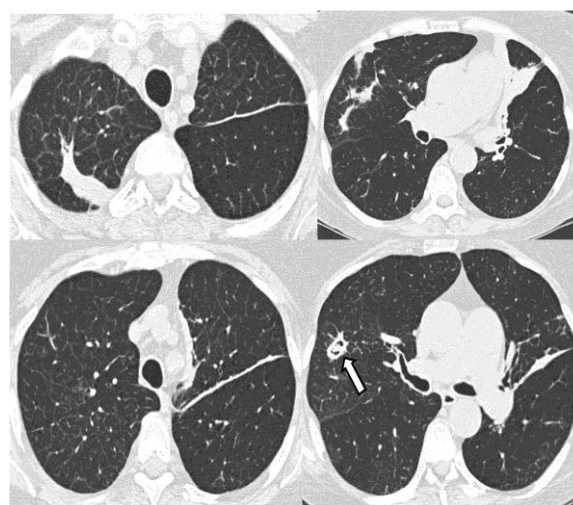


Figure 1D. Atelectasis and pulmonary consolidations were recovered and fungal cavitory lesion due to aspergillus was noted on right lung after 4 weeks of treatment.

Case 2: Allergic aspergillosis in an uncontrolled asthmatic patient

A 42-year-old non-smoker man with uncontrolled severe asthma was referred to our hospital. He was suffering from persistent wheezing, cough and dyspnea and his asthma had not been controlled with optimal asthma treatment. Thoracic CT performed for to definite diagnosis of “Uncontrolled Asthma” and it revealed the infiltrates on right middle lobe and peripheral cavitary lesion which includes an opacity (Figure 2A).

Laboratuary findings; Total IgE level was 6000 IU/ml and white blood cell count was 6410/uL with eosinophils of 1090/ uL (17%). Aspergillus skin test performed and it was positive. The systemic corticosteroid and itrakonazol treatments were started for the diagnosis of “Allergic Aspergillosis with Uncontrolled Asthma”. After the treatment, symptoms and pulmonary lesions were improved (Figure 2B).

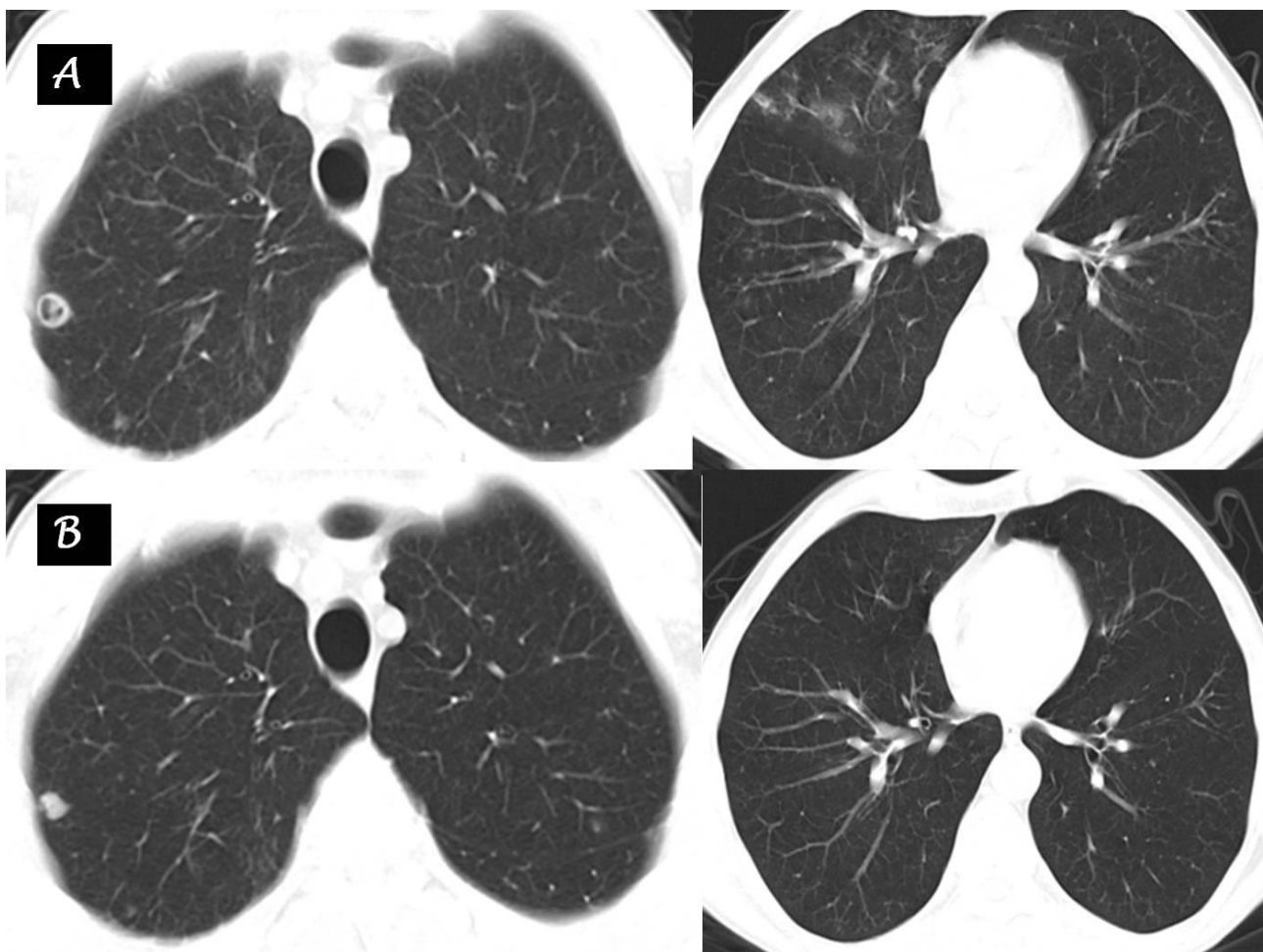


Figure 2A. Thoracic CT performed for to definite diagnosis of “*Uncontrolled Asthma*” and it revealed the infiltrates on right middle lobe and peripheral cavitary lesion which include a opacity(Figure 2AA). After the treatment, the symptoms and pulmonary lesions were improved (Figure 2BB).

Figure 2B. Thorax CT showed the left upper lobe atelectasis, ininterlobular septal thickening with pulmonary mass and dense consolidations on right lung.

Case 3: Chronic Eosinophilic Pneumonia with Respiratory Failure

A 65-year-old man, referred to our Intensive Care Unit for complaints of cough, dyspnea and hypoxemic respiratory failure. Chest radiograph showed bilateral reticular infiltrates on upper fields of lung.(Figure 3A). Despite the treatment for pneumonia with levofloxacin and piperasilin/tazobactam, his radiologic features and symptoms were worsening. Thoracic CT was performed for the definitive diagnosis of “non-responding pneumonia“. Thoracic CT scans demonstrated the bilateral non-segmental airspace consolidations with peripheral predominance on upper lobes of lungs which were consistent with “ photographic negative shadow of pulmonary edema” (Figure 3B).

Finding of photographic negative shadow of pulmonary edema was consistent with Chronic Eosinophilic Pneumonia. His white blood cell count was 24110/uL with eosinophils of 16730/ uL (69.4%). The systemic corticosteroid treatment was started for diagnosis of Chronic Eosinophilic Pneumonia with respiratory failure. After the 3 days of corticosteroid treatment, the respiratory failure and alveolar consolidations were rapidly recovered (Figure 3C).

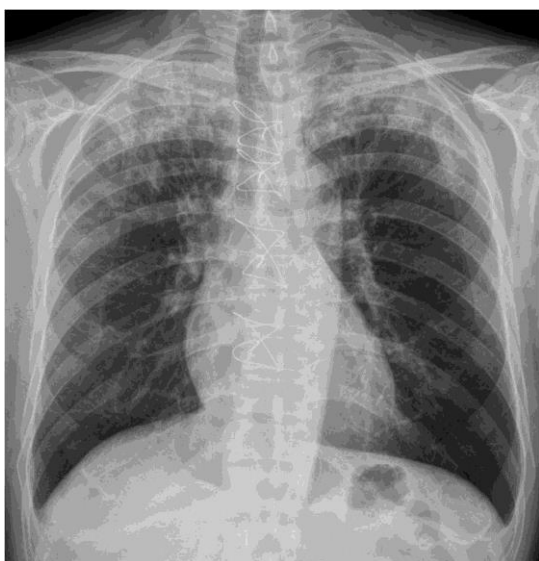


Figure 3A. Chest radiograph showed bilateral reticular infiltrates on upper fields of lung.

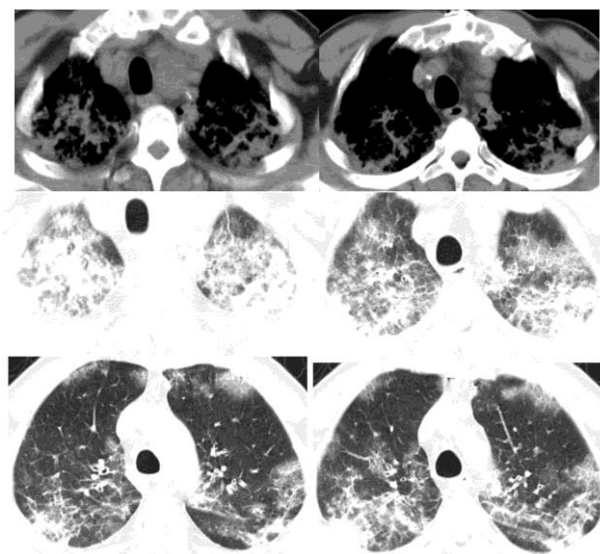
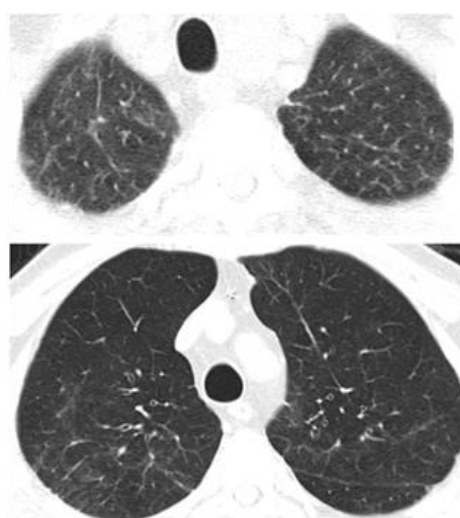


Figure 3B. Thoracic CT scans demonstrated the bilateral non-segmental airspace consolidations with peripheral predominance on upper lobes of lungs which it was consistent with “ photographic negative shadow of pulmonary edema”.



Figure 3C: After the 3 days of corticosteroid treatment, respiratory failure and alveolar consolidations were rapidly recovered



Case 4: Löffler Pneumonia

A 50-year-old non-smoker male admitted to our clinic with dry cough and dyspnea. Thorax CT revealed bilateral fleeting migratory pulmonary nodular opacities (Figure 4A). Lesions did not respond to the antibiotic treatment and malignancy was ruled out with 18 FDG PET/CT scan.

His white blood cell count was 13260 K/uL with eosinophils of 4950 K/ uL(37.3%). The systemic corticosteroid treatment was started for the diagnosis of Löffler Pneumonia and alveolar consolidations were rapidly recovered within 10 days after the corticosteroid treatment (Figure 4B).

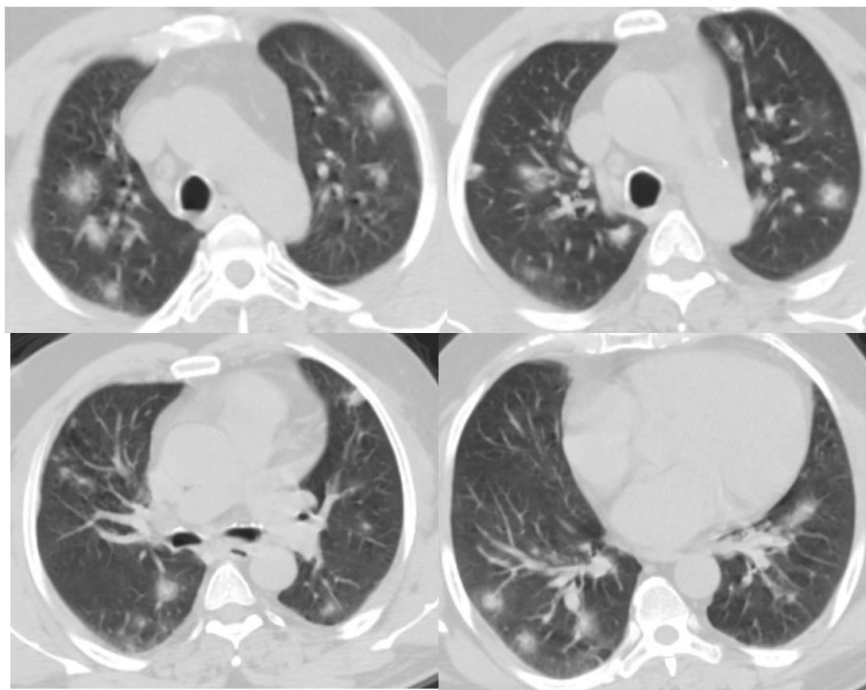


Figure 4A. Thorax CT revealed the bilateral fleeting migratory pulmonary nodular opacities.

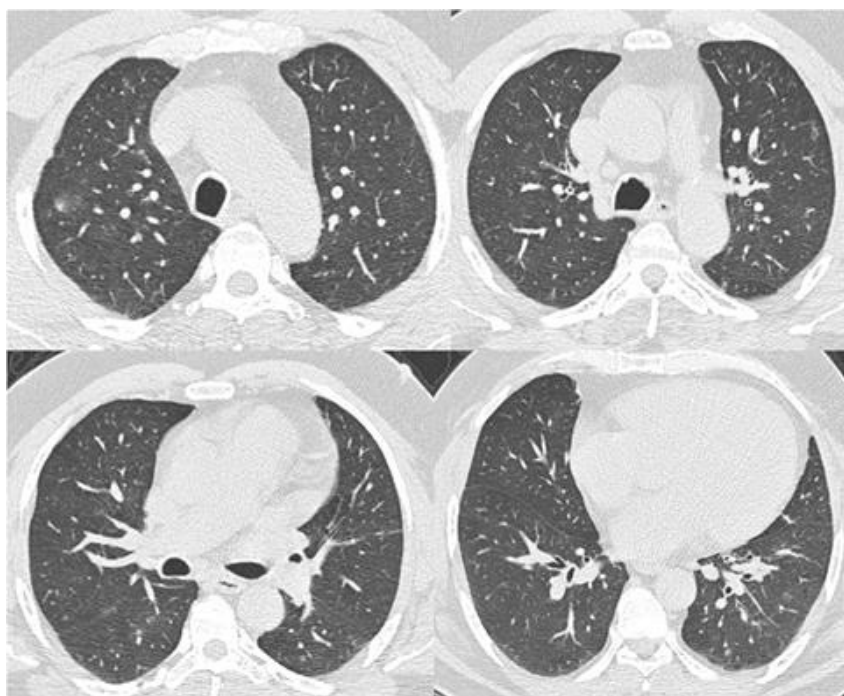


Figure 4B. The systemic corticosteroid treatment was started for diagnosis of Löffler Pneumonia and alveolar consolidations were rapidly recovered within 10 days after the treatment.

Case 5: Eosinophilic mass in a asthmatic patient

A 38 years old male admitted to the hospital with complaints of dyspnea and cough. He had diagnosis of asthma and rhoncus were noted on chest auscultation. Chest radiography showed the plate-like atelectasis on left hemithorax. Thoracic CT scan images revealed the peribronchial mass like pulmonary lesion with atelectasis (Figure 5A).

Fiberoptic bronchoscopy was performed and there was a white colour endobronchial mass in left lower lobe bronchus. Biopsies were taken from endobronchial mass and histopathologic examination showed the eosinophilic inflammatory infiltration (Figure 5B). After the corticosteroid treatment, pulmonary mass was fully recovered (Figure 5C).

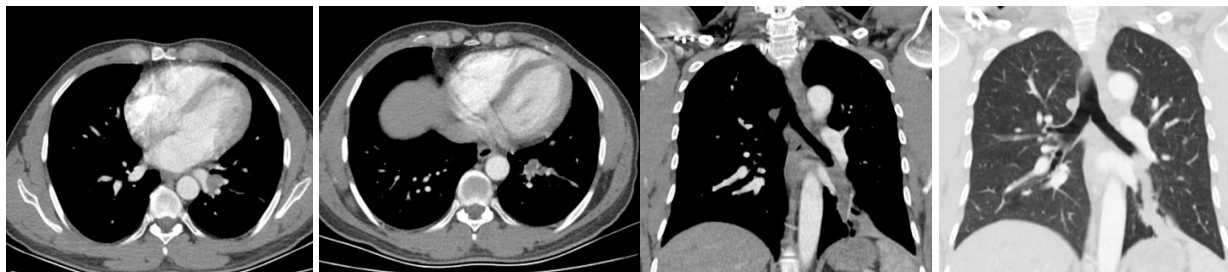


Figure 5A. Thoracic CT scan images revealed the peribronchial mass like pulmonary lesion with atelectasis

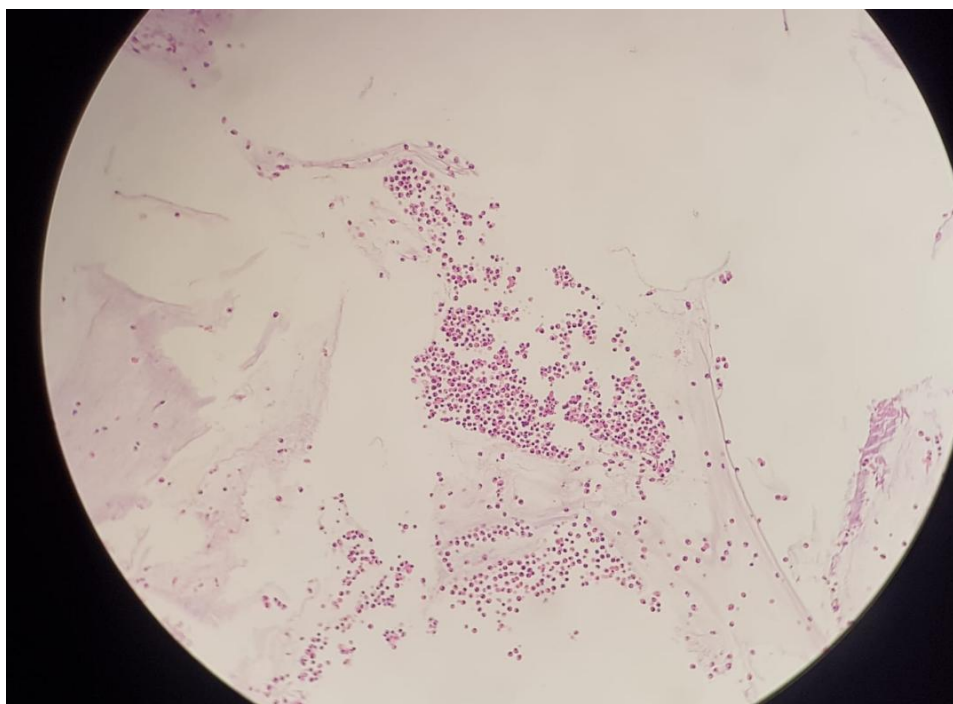


Figure 5B. The histopathologic image showing the eosinophilic infiltration.

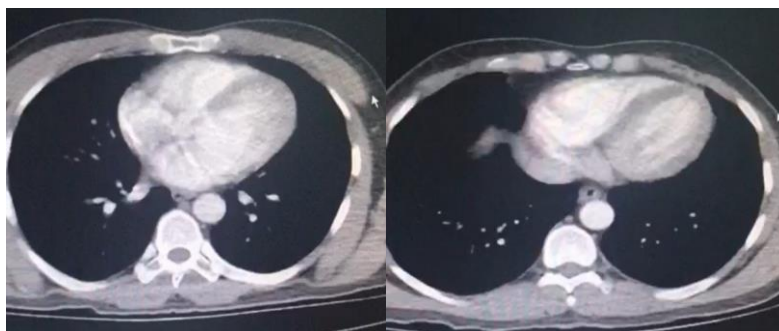


Figure 5C. After the corticosteroid treatment, pulmonary mass was fully recovered.

Case 6: Chronic Eosinophilic Pneumonia

A 54 year-old female referred to our clinic with complaints of cough, dyspnea and unresolved pneumonic infiltrations. Chest radiograph showed bilateral reticular infiltrates (Figure 6A). Thoracic CT scans demonstrated the bilateral non-segmental airspace consolidations with peripheral predominance on upper lobes of lungs which were consistent with “photographic negative shadow of pulmonary edema” (Figure 6B).

The finding of photographic negative shadow of pulmonary edema was consistent with Chronic Eosinophilic Pneumonia. His white blood cell count was 13790 K/uL with eosinophils of 5710 K/uL (41.4%) . Systemic corticosteroid treatment was started for the diagnosis of Chronic Eosinophilic Pneumonia with respiratory failure. After the corticosteroid treatment, the alveolar infiltrates were resolved (Figure 6C and 6D).

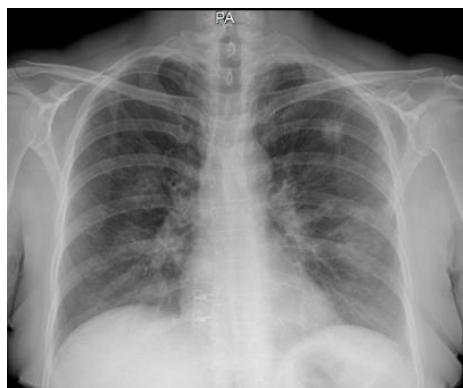


Figure 6A. Chest radiograph showed bilateral reticular infiltrates.

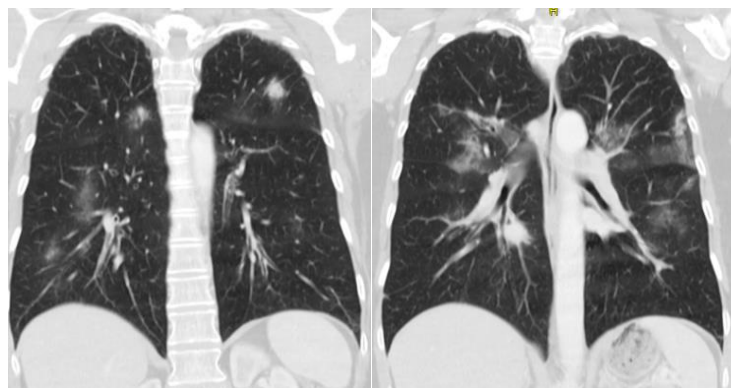


Figure 6B. Thoracic CT scans demonstrated the bilateral non-segmental airspace consolidations with peripheral predominance which it was consistent with “*photographic negative shadow of pulmonary edema*”.



Figure 6C. Chest radiography showed that after the corticosteroid treatment, the alveolar infiltrates were completely resolved.

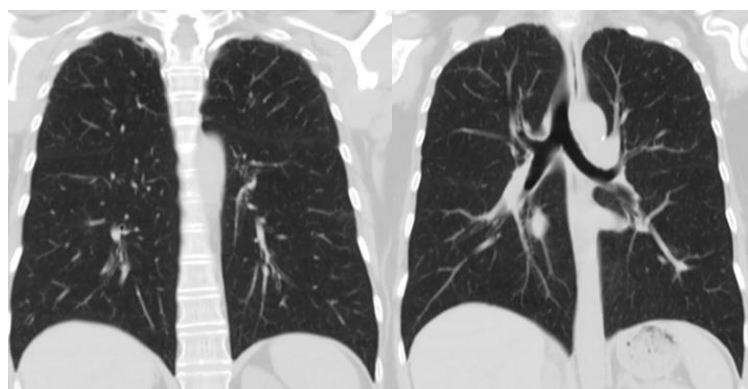


Figure 6D. Thorax CT images showed that after the corticosteroid treatment, the alveolar infiltrates were completely resolved.

Case 7: Acute Eosinophilic Pneumonia

A 32 years old male referred to ICU for ARDS. His chest radiography showed the bilateral diffuse infiltrates (Figure 7A). Thoracic CT images revealed the bilateral diffuse alveolar-interstitial infiltrates with air bronchograms (Figure 7B). He was received antipsychotic, antidepressant and antiepileptic drugs including risperidone, quetiapine, carbamazepine, valproic acid (sodium valproate) due to schizophrenia and epilepsy.

His white blood cell count was 4860 K/uL with eosinophils of 0 K/uL (0%). We suspected from Acute Eosinophilic Pneumonia caused from risperidone and it was stopped. Systemic corticosteroid treatment was started for the diagnosis of Acute Eosinophilic Pneumonia with respiratory failure. After the corticosteroid treatment, the alveolar infiltrates and respiratory were rapidly resolved (Figure 7C).

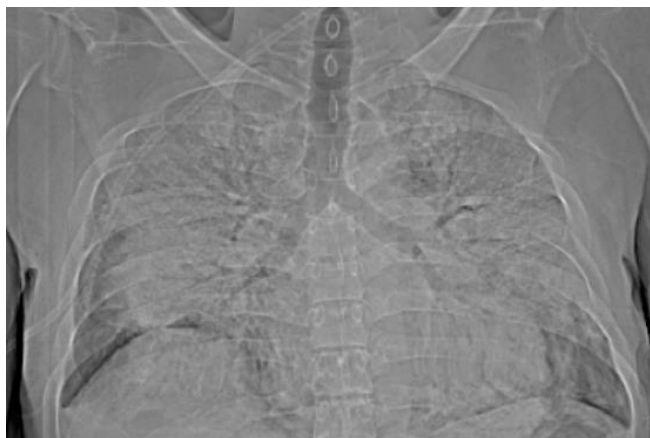


Figure 7A. Chest radiography showing the bilateral diffuse infiltrates.

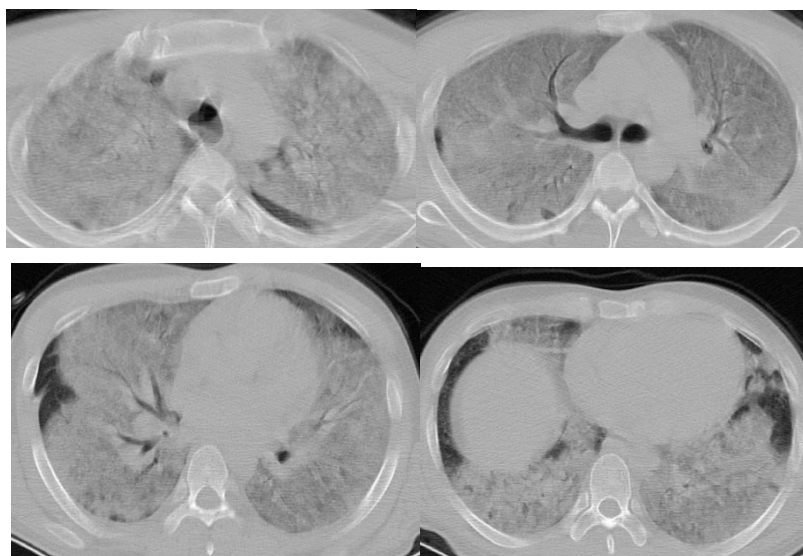


Figure 7B. Thoracic CT images showing the bilateral diffuse alveolar-interstitial infiltrates with air bronchograms.

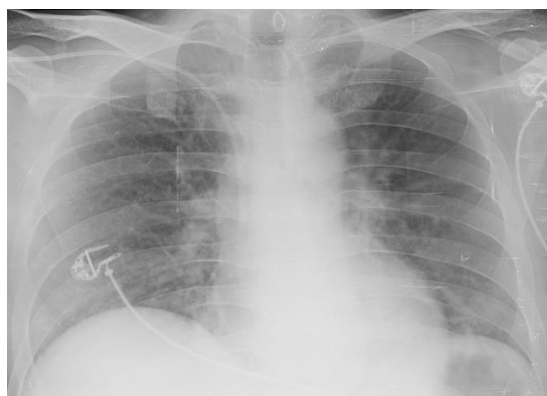


Figure 7C. After the corticosteroid treatment, alveolar infiltrates and respiratory were rapidly resolved.

Discussion

The eosinophil is a multifunctional leukocyte implicated in the pathogenesis of a wide range of inflammatory reactions. It modulates immune responses at the sites of inflammatory foci within several organ systems. Although several different normal values have been reported, normal blood generally contains 50–250 eosinophils per microliter (3,4).

Most eosinophilic lung diseases manifest with peripheral eosinophilia, although acute eosinophilic pneumonia (AEP) may not. Diagnosis is based on demonstration of opacities on chest x-ray and identification of eosinophilia (>450/ μ L) in peripheral blood, bronchoalveolar lavage fluid, or lung biopsy tissue.

The most valuable clinical information is derived from the patient's history and from physical examination. The duration and severity of symptoms are also of critical importance. CEP typically affects patients in their 30s or 40s, although onset in childhood has been reported. The disease has a gradual onset, with an interval of approximately four to five months between the appearance of initial symptoms and diagnosis.

Typical symptoms include a cough, fever, breathlessness, weight loss, and night sweats, as seen in our cases. Löffler syndrome, a form of eosinophilic pulmonary disease, is characterized by absent or mild respiratory symptoms (most often dry cough), fleeting migratory pulmonary opacities, and peripheral blood eosinophilia. Parasitic infections, especially *Ascaris lumbricoides*, may be the cause, but an identifiable etiologic agent is not found in up to one third of patients.

Treatment of Löffler syndrome may consist of corticosteroids. Pulmonary function tests can occasionally be useful in the evaluation of patients with unexplained pulmonary eosinophilia. Some eosinophilic lung diseases (Acute Eosinophilic Pneumonia (AEP), Chronic Eosinophilic Pneumonia (CEP), tropical pulmonary eosinophilia) are typically accompanied by mainly restrictive ventilatory defects, whereas others (ABPA, Churg-Strauss syndrome) typically cause mainly obstructive ventilatory defects. Bronchoalveolar Lavage (BAL) can also be very useful in the evaluation of patients with eosinophilic lung disease (10).

Normal BAL fluid consists of less than 1% eosinophils. Because some disorders are not accompanied by peripheral eosinophilia, BAL may provide the first (and, perhaps, the only) indication of an eosinophilic lung disease. Patients with eosinophilic lung disease may be identified initially on the basis of pulmonary symptoms or chest radiographic abnormalities accompanied by blood or tissue eosinophilia. Diverse and nonspecific findings may also be seen at conventional chest radiography.

Chest computed tomography (CT) demonstrates a more characteristic pattern and distribution of parenchymal opacities than chest direct radiography. Although the characteristic CT findings are often helpful, there is still a considerable overlap of CT findings among the various eosinophilic lung diseases (5,6).

Acute eosinophilic pneumonia (AEP) is a rare and life-threatening clinic condition, as seen in our 6th case. Many causes such as collagen diseases, infections, irradiation, toxins, neoplasia and a long list of drugs can be implicated in the development of AEP (7).

Antibiotics and non-steroid anti-inflammatory drugs (NSAIDs) are the most commonly reported drugs associated with AEP.

Toxins suspected of causing eosinophilic pneumonia include cigarette smoke and illicit drugs (cocaine, heroine). Drug- or toxin-induced eosinophilic pneumonia is indistinguishable from idiopathic acute or chronic eosinophilic pneumonia by clinical, radiographic, and histopathologic criteria. Diagnosis is supported by a temporal relationship to a drug or toxin. The condition usually resolves with removal of the agent and recurs with rechallenge (8).

Rizos et. al, reported the first case with risperidone-induced AEP (9). Eosinophils are exquisitely sensitive to corticosteroids and completely disappear from the bloodstream within a few hours after administration of corticosteroids. This rapid disappearance from the blood may obscure the diagnosis in patients who receive corticosteroids before the diagnostic assessment is instituted.

Conclusion

Peripheral eosinophilia with pulmonary infiltrates are diagnostic clues of eosinophilic lung diseases. Systemic corticosteroids are provides rapid control not only in symptoms but also radiological and clinical improvement.

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Author's Contributions: ÖOK, ÖMT, BÇ, İGÖ, BÇ; Research concept and design, Patient examinations, Research the literature, preparation of the article. Chemical Analysis. BÇ; Revision of the article.

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