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Successful treatment of acute relapse of chronic eosinophilic pneumonia with benralizumab and without corticosteroids: A case report

Izhakian S *et al.* Treatment of eosinophilic pneumonia with benralizumab

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Abstract

BACKGROUND

Currently, the mainstay of chronic eosinophilic pneumonia (CEP) treatment is corticosteroids, usually with a favorable response and good prognosis. However, relapse is common, requiring long-term use of corticosteroids, with risk of significant treatment-related complications. The dire need to develop new treatments for patients with CEP, who are dependent on, or resistant to corticosteroids has led to exploring novel therapies. We herein describe a patient with acute relapse of CEP, who was successfully treated with benralizumab, an IL-5R α antagonist that has demonstrated rapid anti-eosinophil action in patients with asthma. Currently, only three recent patient reports on CEP relapse, also demonstrated successful treatment with benralizumab alone, without corticosteroids.

CASE SUMMARY

A 31-year-old non-smoking woman presented in our hospital with a 3-wk history of shortness of breath, dry cough and fever up to 38.3 °C. Laboratory examination revealed leukocytosis 10240 K/ μ L, eosinophilia 900 K/ μ L and normal values of hemoglobin, platelets, creatinine and liver enzymes. Computed tomography of the chest showed a mediastinal lymphadenopathy and consolidations in the right upper and left lower lobes.

CEP was diagnosed, and the patient was treated with hydrocortisone intravenously, followed by oral prednisone, with prompt improvement. Three months later, she presented with relapse of CEP: aggravation of dyspnea, rising of eosinophilia and extension of pulmonary infiltrates on chest X-ray. She was treated with benralizumab only, with clinical improvement within 2 wk, and complete resolution of lung infiltrates following 5 wk.

CONCLUSION

Due to Benralizumab's dual mechanism of action, it both neutralizes IL-5R α pro-eosinophil functions and triggers apoptosis of eosinophils. We therefore maintain benralizumab can serve as a reasonable therapy choice for every patient with chronic eosinophilic pneumonia and a good alternative for corticosteroids.

Key Words: Benralizumab; Eosinophilic pneumonia; Interstitial lung disease; Corticosteroid withdrawal; Case report

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Core Tip: Chronic eosinophilic pneumonia (CEP) is an idiopathic pulmonary disease, characterized by marked eosinophil accumulation in the pulmonary parenchyma. Currently, the mainstay of CEP treatment is corticosteroids. However, relapse is common, requiring long-term use of corticosteroids, with the risk of significant treatment-related adverse effects. Herein, we describe a patient with an acute CEP relapse, successfully treated with benralizumab alone, without corticosteroids. Currently, only three patients with acute relapse of CEP, were reported successfully treated with benralizumab alone, without corticosteroids. This therapy option may be particularly

beneficial for patients who have previously suffered serious adverse effects from or have any contraindications to chronic corticosteroid treatment.

1 **INTRODUCTION**

Chronic eosinophilic pneumonia (CEP) is an inflammatory lung disease, clinically characterized by isolated pulmonary involvement, with appearance of pulmonary eosinophilic infiltrates^[1] that permeate the lungs, presenting symptoms include cough, fever and dyspnea^[2]. Response to oral corticosteroids (OCS), the commonly administered treatment for CEP, is usually dramatic and rapid^[3]. However, in approximately 50% of the patients, CEP relapses under tapering of OCS, and thus long-term OCS administration is required^[3]. Unfortunately, chronic OCS treatment has a proven increased risk for treatment-related adverse effects and complications, (e.g. hypertension, diabetes mellitus, osteoporosis and infections)^[4]. Therefore, the dire need to develop new treatments for patients with CEP, who are dependent on, or resistant to OCS has led to exploring novel therapies. Benralizumab, an IL-5R α antagonist has demonstrated rapid anti-eosinophil action in patients with asthma. Successful treatment with benralizumab, was also recently reported in three patients with acute relapse of CEP^[5-7]. We herein describe an additional patient with an acute relapse of CEP who was successfully treated with benralizumab alone, without corticosteroids.

CASE PRESENTATION

Chief complaints

On July 26, 2020, a 31-year-old non-smoking healthy woman was evaluated in our hospital. She presented with a 3-wk history of shortness of breath, dry cough and fever up to 38.3 °C.

History of present illness

Two weeks prior to the presentation at our medical center, the patient was examined at a local emergency department for the same complaints, which had then appeared for one week. At that time, a chest X-ray showed infiltrates in the right upper and left lateral lung fields (Figure 1A). The laboratory examination revealed mild leukocytosis 11200 K/ μ L, eosinophilia 800 K/ μ L and an elevated level of serum C-reactive protein 45 mg/L. Nasopharyngeal swabs were negative for coronavirus disease 2019 (COVID-19). She was discharged home from the local hospital with recommendations for oral treatment with cefuroxime 500 mg and roxithromycin 150 mg, both twice daily for 7 days.

History of past illness

No specific history of past illness was reported.

Physical examination

The patient's temperature was 37.3 °C, heart rate 97 beats per minute, respiratory rate 16 breaths per minute, blood pressure 103/71 mmHg and oxygen saturation in room air 97%. On the chest examination, crepitation was detected on the left lung base. The rest of the physical examination was unrevealing.

Laboratory examinations

Abnormal laboratory findings included leukocytosis 10240 K/ μ L and eosinophilia 900 K/ μ L. Results of other routine blood tests were normal. A screening panel was negative for allergic bronchopulmonary aspergillosis, including *Aspergillus* specific immunoglobulin E and *Aspergillus fumigatus* serum precipitant. No antinuclear and anti-neutrophil cytoplasmic antibodies were detected. Serologic tests for *Toxocara*, *Strongyloides*, *Schistosoma* and *Echinococcus* were negative.

Imaging examinations

Computed tomography (CT) of the chest (axial plain) showed a mediastinal lymphadenopathy, and pulmonary consolidations in the right upper and left lower lobes (Figure 1B).

FINAL DIAGNOSIS

Eosinophilic pneumonia was diagnosed based on clinical symptoms, peripheral blood eosinophilia, peripheral lung consolidation on chest CT and prompt response to systemic glucocorticoid therapy.

TREATMENT

The patient was treated with hydrocortisone intravenously at a dosage of 100 mg three times per day, for 2 days, with rapid improvement of dyspnea and cough. The treatment was switched to oral prednisone, at a daily dosage of 40 mg, which was tapered down during the following 2 mo. On September 6, 2020, the patient was feeling well, eosinophilia had resolved, and pulmonary infiltrates no longer appeared on chest X-ray (Figures 1C, 1D).

OUTCOME AND FOLLOW-UP

On December 06, 2020, the patient was reevaluated, due to recurrence of dyspnea, cough and fever. Laboratory examination demonstrated blood eosinophilia 600 K/ μ L, white blood cells 8.8 k/ μ L and C-reactive protein 0.2 mg/dL. Chest X-ray revealed a new infiltrate in the right lower lobe of the frontal view (Figure 1E), which was clearer in the lateral view (Figure 1F). Acute relapse of CEP was diagnosed. We discussed with the patient treatment options, including the advantages and disadvantages of therapy with OCS *vs* anti-interleukin-5 drug, benralizumab. It was decided to start (on December 7, 2020) benralizumab subcutaneously, at a dosage of 30 mg monthly, without OCS. Following 2 wk, the patient reported significant improvement of the symptoms. One month after the first injection of benralizumab, eosinophils were zero and WBC 4 k/ μ L; CRP was not taken. Five weeks after the first injection, a chest X-ray was unrevealing

(Figure 1G, 1H). Two months later, the patient received the second and third injections of benralizumab and demonstrated sustained clinical and radiographic remission of CEP.

DISCUSSION

To the best of our knowledge, we present the fourth recent report in the medical literature regarding rapid improvement of acute flare of CEP, following treatment with benralizumab, without OCS. In previous cases, benralizumab therapy was initiated after frequent, acute CEP relapses, or as an alternative after patient refusal to reinstitute OSC, due to treatment-related adverse effects. Isomoto *et al*^[5] described a 58-year-old woman with CEP and a history of refractory asthma. She had three flares of her concomitant disease in the preceding year, which necessitated OCS therapy. Only for the fourth flare, her treating physician initiated a different therapy, one injection of benralizumab, which induced remission of her asthma and CEP following 16 wk. Izumo *et al*^[6] described a 43-year-old healthy woman who presented with chronic cough. She was diagnosed with CEP and successfully treated with prednisolone. However, her symptoms worsened after prednisolone cessation. Following patient refusal to re-initiation of OCS, due to treatment-related adverse effects, benralizumab treatment was initiated. After 6 mo of benralizumab therapy, sustained remission of CEP was achieved. Yazawa *et al*^[7] described a 70-year-old woman with a history of bronchial asthma who had dyspnea and cough for one month, and was diagnosed with CEP. She refused OCS and therefore was treated with benralizumab, which resulted in resolution of symptoms, hypoxemia and lung infiltrates. Moreover, 12 mo benralizumab maintenance treatment without OCS, provided sustained remission of CEP.

CEP is an idiopathic lung disease that is characterized by isolated pulmonary involvement, with marked eosinophil accumulation in the pulmonary parenchyma^[1,2]. Therefore, we maintain benralizumab is a reasonable therapy choice for every patient with CEP. Predominately, due to its dual mechanism of action, benralizumab a humanized monoclonal antibody, as an interleukin-5 receptor α (IL-5R α) antagonist, neutralizes the pro-eosinophil functions of IL-5R, by binding to its α subunit and by

binding to FcγRIIIa receptor expressed by natural killer cells, triggers apoptosis of eosinophils *via* antibody-dependent cell-mediated cytotoxicity^[8]. This therapy is especially important in patients with CEP, who present with specific clinical scenarios. As demonstrated, treatment with benralizumab may be beneficial for patients with frequent CEP relapses. Clearly, benralizumab could be the drug of choice in patients who demonstrate serious adverse effects following OCS therapy. Likewise, benralizumab therapy seems to be preferred in patients with comorbidities that are expected to be aggravated under OCS treatment.

CONCLUSION

For treatment of CEP, we maintain benralizumab can serve as a reasonable therapy choice for every patient and a good alternative for OCS.

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SIMILARITY INDEX

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