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# A Case of Bronchiolitis Obliterans Secondary to Rheumatoid Arthritis that Diagnosed by the Aid of High Resolution Computed Tomography

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## SUMMARY

Rheumatoid arthritis (RA) is the most common of the classic connective tissue diseases and the spectrum of RA-associated lung disease is extremely broad including bronchiolitis obliterans (BO). We report a case of 67 year-old female presented with progressive dyspnea and arthralgia for a year, who met the criteria of the American Rheumatism Association (ARA) for RA. Chest x-ray showed hyperinflation and bilateral basilar reticulonodular opacities. Inspiratory high resolution computed tomography (HRCT) scans demonstrated mosaic perfusion and expiratory HRCT scans revealed air trapping that were consistent with BO. The final diagnosis was BO secondary to RA. HRCT scans taken at end-inspiration and end-expiration successively, can be diagnostic for BO in the correct clinical context.

**Key Words:** Rheumatoid arthritis, bronchiolitis obliterans, high resolution computed tomography.

## ÖZET

### **Yüksek Rezolüsyonlu Bilgisayarlı Tomografi Yardımıyla Tanı Alan Bir Romatoid Artrite Sekonder Gelişen Bronşiolitis Obliterans Olgusu**

En sık görülen kollajen doku hastalığı olan romatoid artrit (RA)'in neden olduğu akciğer hastalıkları spektrumu oldukça geniş olup bronşiolitis obliterans (BO) da bu spektrum içinde yer alır. Bir yıldır progresif dispne ve eklem ağrıları olan 67 yaşında kadın hastayı sunuyoruz. Hasta Amerikan Romatizma Cemiyeti (ARA)'nın RA kriterlerine uymaktaydı. Akciğer grafisinde bilateral havalanma fazlalığı ve bazal zonlarda retikülonodüler opasiteler mevcuttu. İnspiryumda çekilen yüksek rezolüsyonlu bilgisayarlı tomografi (YRBT)'de mozaik perfüzyon ile ekspiryumda çekilen YRBT'de hava hapsi "air trapping" görülmesi BO ile uyumluydu. Tüm bunların ışığı altında tanı RA'ya sekonder BO olarak kabul edildi. BO'nun düğünlüğü klinik durumlarda ardışık olarak alınan inspiryum ve ekspiryum YRBT görüntüleri tanısal değerdedir.

**Anahtar Kelimeler:** Romatoid artrit, bronşiolitis obliterans, yüksek rezolüsyonlu bilgisayarlı tomografi.

Rheumatoid arthritis (RA) is the most common of the classic connective tissue diseases. The pleuropulmonary manifestations of RA are extremely broad, the most common of which are pleural abnormalities and interstitial lung disease. Bronchiolitis obliterans (BO) also occur in patients with rheumatoid disease. High resolution computed tomography (HRCT) scanning, especially taken at end-inspiration and end-expiration successively, demonstrates characteristic findings of BO.

### CASE REPORT

A 67 year-old female presented with progressive dyspnea, nonproductive cough for a year. The patient also complained of morning stiffness and arthralgia in both wrists and fingers of six months duration. Physical examination revealed a dyspneic patient, with both mid and end-inspiratory rales on both lung fields on auscultation. Arthritis of both proximal interphalangeal and metacarpophalangeal joints and wrists, symmetrically, were noticed. Laboratory findings were as follows: Complete blood count: White blood cell:  $9400/\text{mm}^3$ , hemoglobin: 14.3 gr/dL, erythrocyte sedimentation rate: 60 mm/hr, platelet count:  $264.000/\text{mm}^3$ . Whole blood chemistry: Aspartate transaminase (AST): 66 U/L (N: < 40 U/L), alanine transaminase (ALT): 64 U/L (N: < 50 U/L), others were within normal limits. Serology: RF:-, ANA:-, antiDNA:-. The results of thyroid function tests, electrocardiography and echocardiography were normal. Pulmonary function tests (PFTs): Forced vital capacity (FVC): 0.78 L/min (33% of predicted), forced expiratory volume in one second ( $\text{FEV}_1$ ): 0.45 L/min (23% of predicted),  $\text{FEV}_1/\text{FVC}$ : 71% of predicted, forced expiratory flow during the middle half of the forced vital capacity ( $\text{FEF}_{25\%-75\%}$ ): 15% of predicted, consistent with obstructive pattern and small airway disease, and there was no response to reversibility test with bronchodilator. Arterial blood gases (ABGs): pH: 7.51,  $\text{PaO}_2$ : 67 mmHg, sat  $\text{O}_2$ : 95%,  $\text{PaCO}_2$ : 29 mmHg,  $\text{HCO}_3$ : 23 mmol/L, alveoloarterial oxygen pressure difference ( $\text{P[A-a O}_2]$ ): 47 (N: <20) that was increased. The plain radiographs of both wrists and hands demonstrated periarticular osteopenia in the proximal interphalangeal, metacarpophalangeal and wrist joints. The postero-anterior and lateral chest ra-

diographs showed hyperinflation and bilateral reticulonodular opacities (Figure 1 and Figure 2 respectively). We tried to perform bronchoscopy but the patient could not tolerate the procedure. HRCT scans, taken at the end-inspiration, showed mosaic perfusion on both lung fields (Figure 3). The next step was to take HRCT scans at end-expiration, that revealed air trapping (Figure 4).

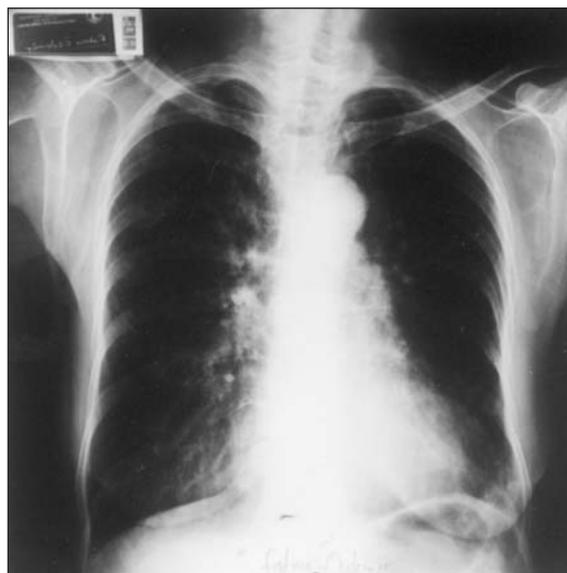


Figure 1. Postero-anterior chest x-ray showed hyperinflation and bilateral basilar reticulonodular opacities.



Figure 2. Lateral chest x-ray demonstrated increase in retrosternal and retrocardiac air space and flattening of diaphragmatic contours that were consistent with hyperinflation.



Figure 3. HRCT scans taken at right middle lobe level at end-inspiration showed mosaic perfusion on both lung fields.

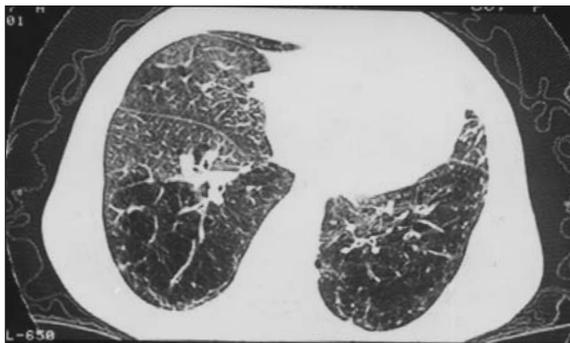


Figure 4. HRCT scans taken at right middle lobe level at end-expiration showed exaggeration of heterogeneity of lung density consistent with air trapping.

In conclusion, the patient was diagnosed as bronchiolitis obliterans as a pulmonary manifestation of RA and steroid treatment as a prednisone 60 mg/day was given and her respiratory status and exercise capacity were improved, despite no significant difference between pre- and post-treatment PFTs.

### DISCUSSION

The patient met five criteria of the American Rheumatism Association (ARA) for the diagnosis of RA: Morning stiffness of six weeks, arthritis of the proximal interphalangeal, metacarpophalangeal, or wrist joints of six weeks, symmetrical arthritis of six weeks, more than three arthritis of

six weeks and radiographic erosions or periarticular osteopenia in hands or wrist joints (1).

The clinical and radiographic findings and also the results of PFTs were all consistent to bronchiolitis obliterans (BO).

The association of obliterative bronchiolitis and RA was first reported in 1977 by Geddes et al (2). Since then many cases of obliterative bronchiolitis complicating RA have been reported. This entity is thought to be synonymous with bronchiolitis obliterans (3).

Bronchiolitis obliterans, unlike the other pleuropulmonary complications of RA, is more common in woman in their fifth to sixth decades of life (4). The etiology is idiopathic, although some associations including penicillamine, gold therapy, chronic eosinophilic pneumonia have been reported (2-5).

Clinically, patients present with dyspnea and nonproductive cough that are usually severe and rapidly progressive that distinguish BO from other pulmonary manifestations of RA (6). Usually the patients are seropositive for RF, but it is not the rule. Physical examination reveals inspiratory crackles. Pulmonary function tests show obstructive pattern with no reversibility to bronchodilator test and with small airway involvement.

The chest radiograph is usually normal or may show signs of hyperinflation. In BO, HRCT scanning is much more sensitive than plain radiography and demonstrates a characteristic mosaic pattern of attenuation and perfusion, also called as inhomogenous attenuation. Abnormal regions of lung have decreased attenuation and decreased vascularity, whereas the relatively normal areas of lung have increased attenuation and increased vascularity caused by redistribution of blood flow. HRCT scans performed at end-expiration show areas of air trapping (7-9). Arakawa et al demonstrated that expiratory HRCT scans significantly improved diagnostic accuracy in patients with inhomogenous attenuation on inspiratory scans (9). In our case, inspiratory HRCT scans demonstrated a characteristic mosaic pattern of attenuation and perfusion. To de-

termine whether vascular or airway disease is underlying cause of the pattern, the expiratory HRCT was the next step, that showed exaggeration of heterogeneity of lung density, that was consistent with air trapping.

Pathologically, there is submucosal and peribronchiolar fibrosis with little active inflammation resulting in extrinsic narrowing and obliteration of the bronchiolar lumen.

Corticosteroids are the drug of choice for treatment, but with variable results (3,6). Cyclophosphamide and intravenous corticosteroids in high doses have also been reported as useful (10).

In conclusion, in any patient with RA and rapidly progressive air flow obstruction accompanied by dyspnea and nonproductive cough, bronchiolitis obliterans should be considered, and both inspiratory and expiratory HRCT scans should be ordered to reach the diagnosis earlier.

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