Thoracic lung involvement in rheumatoid arthritis: Findings on HRCT

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Learning objectives

• To review the pathology and symptoms/signs of lung involvement in rheumatoid arthritis (RA).

• Describe and explain the findings of pulmonary involvement of RA in high-resolution computed tomography (HRCT).

• Understand and describe the radiological differential diagnosis.
Background

RA is a chronic multisystem disease of unknown etiology with a prevalence of 1-2% of the general population. It occurs more often in women than in men, with the highest incidence occurring between the ages of 25 and 50 years. In nearly 50% of patients with rheumatoid arthritis, there is some form of extraarticular involvement in the disease process. Lung disease is the second most common cause of death, after infection.

Although the characteristic alteration is an inflammatory sinovitis with production of a chronic polyarthritis, extra-articular manifestations appear frequently, being more common in men. There are rheumatoid nodules, muscle atrophy, rheumatoid vasculitis, pleuropulmonary manifestations and pericarditis.

Pulmonary symptoms occur months or years after the onset of the joint disease. Clinical signs of pulmonary involvement can include dyspnea, cough, pleuritic pain, finger clubbing, hemoptysis, infection, bronchopleural fistula or pneumothorax. Patients may also be asymptomatic.
Findings and procedure details

From July 2009 to July 2014, we reviewed the patients diagnosed in our hospital, of pleuropulmonary involvement in the context of RA, more representatives to describe this entity.

In RA patients the HRCT is abnormal in 50%, being more sensitive than pulmonary function tests.

The most common abnormality in RA is the pleural disease with pleural effusion or pleural thickening. The pleural effusion is much more common in men. In general it is small to large, usually unilateral and transient, persistent, or relapsing. As a complication, the pleural effusion can infect and transform into an empyema.

*Rheumatoid lung disease:*

The patterns of interstitial disease are diverse and include nonspecific interstitial pneumonia (NSIP), usual interstitial pneumonia (UIP), cryptogenic organizing pneumonia and follicular bronchiolitis. The most common pattern is UIP.

Chest radiographic: honeycomb cysts most evident at the lung bases and peripheral reticular opacities with lower-lobe volume loss.

Computed tomography: the abnormalities have a distribution basal and peripheral. There are reticular opacities, honeycomb cysts, traction bronchiectasis and bronchiolectasis. When the disease is advanced, there are architectural distortion and lobar volume loss.

Rheumatoid pulmonary nodules occur more often in men with positive rheumatoid factor, smoking and subcutaneous nodules. Pulmonary nodules may arise before rheumatoid arthritis is manifested clinically or may develop concurrently. They typically have a maximum diameter of 0.5 - 7.0 cm, are usually located in peripheral zones of the upper and middle lung regions, and are commonly asymptomatic. Pulmonary nodules may undergo cavitation, increase in size, or resolve spontaneously over time, and new ones may arise as older ones resolve. These can associated with pleural effusion, pneumothorax or hydropneumothorax.
**Respiratory disease:**

Obliterative bronchiolitis is also a complication of rheumatoid arthritis. In CT there are mosaic attenuation pattern with scattered areas of air trapping on expiratory CT images. Associated bronchiectasis and bronchial wall thickening also is often seen.

In some cases follicular bronchiolitis is also seen. HRCT findings include multiple micronodules, which often show ground-glass attenuation, in a predominantly centrilobular distribution.

**Drug reaction**

Various drugs used to treat rheumatoid arthritis may cause lung disease. It can appear infiltrative lung disease, opportunistic infections, hypersensitivity pneumonitis and diffuse alveolar damage. Some of the drugs are: gold salts, penicillamine and methotrexate. The CT reveals patchy ground-glass opacities with centrilobular nodules and lymphadenopathy. Discontinuation of drug therapy and initiation of high dose corticosteroid therapy usually lead to a good outcome.

In the differential diagnoses are:

1. **Idiopathic pulmonary fibrosis:** Pulmonary involvement is peripheral with basilar fibrosis and honeycombing on HRCT. Absence of pleural, pericardial and airways disease, as well as skeletal erosions.
2. **Scleroderma:** There are identical imaging findings with NSIP pattern on HRCT. This disease is characterized by dilation of the esophagus, because relaxation of lower esophageal sphincter. Hallmark is acroosteolysis.
3. **Cryptogenic organizing pneumonia:** May exhibit identical imaging findings with UIP pattern on HRCT. There are pleural plaques with calcification or thickening. For diagnosis is key occupational history and there isn´t skeletal erosions.
4. **Asbestosis:** Pulmonary involvement is bilateral or unilateral with patchy consolidations or ground-glass opacities. It is often subpleural or peribronchial. Basilar irregular linear opacities are also seen.
**Fig. 1:** Right and left pleural effusion.

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Fig. 2: Axial HRCT of a patient with RA shows pulmonary fibrosis with honeycombing
(red arrow), reticulation, and mild ground-glass opacity, suggestive of usual interstitial
pneumonia pattern of disease.

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Fig. 3: Axial expiratory HRCT of a patient with RA shows large regions of air-trapping (red arrow) secondary to RA-related constrictive bronchiolitis. Traction bronchiectasis (yellow arrow), reticulation, and mild ground-glass opacity, suggestive of usual interstitial pneumonia pattern of disease.

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**Fig. 4:** Axial expiratory HRCT of a patient with RA shows a nodule (red arrow), consistent with a rheumatoid nodule.
Fig. 5: Axial expiratory HRCT of a patient with RA shows large regions of air-trapping secondary to RA-related constrictive bronchiolitis. Traction bronchiectasis, reticulation, and mild ground-glass opacity, suggestive of usual interstitial pneumonia pattern of disease.
Fig. 6: Axial HRCT of a patient with RA shows pulmonary fibrosis with honeycombing (red arrow), reticulation, and mild ground-glass opacity, suggestive of usual interstitial pneumonia pattern of disease.

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Fig. 7: HRCT coronal of a patient with RA. Solid subpleural nodule, 15 mm of diameter, in the anterior segment of the left upper lobe, consisting of a rheumatoid nodule.

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**Fig. 8:** HRCT sagittal of a patient with RA. Solid subpleural nodule, 15 mm of diameter, in the anterior segment of the left upper lobe, consisting of a rheumatoid nodule.

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Conclusion

- The lung is a relatively frequent site of extraarticular involvement in RA.
- HRCT detected lung disease even in the absence of respiratory symptoms and lung function test positive.
- The most common finding is the pleural effusion or thickening, followed by interstitial fibrosis, interstitial pneumonia and nodules.
- The most usual airway involvement are bronchiectasis and air trapping.
- Differential diagnosis are idiopathic pulmonary fibrosis, scleroderma, cryptogenic organizing pneumonia and asbestosis.
References