Pulmonary rheumatoid nodules: an overview of computed tomographic findings

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Learning objectives

- To describe the computed tomographic (CT) features of rheumatoid nodules.

- To evaluate the change of morphology of rheumatoid nodules over time

Background

Rheumatoid arthritis (RA) is a common systemic autoimmune disease with a prevalence between 0.5 and 2%. Extra-articular manifestations are estimated to occur in 8 to 20% of patients [1]. Pulmonary disease in RA can have many presentations. Tanaka et al have classified the CT features of pulmonary RA into four predominant patterns: usual interstitial pneumonia, nonspecific interstitial pneumonia, bronchiolitis and organizing pneumonia, in decreasing order of frequency [2].

Pulmonary nodules on CT have been reported in as many as 22 to 49% of RA patients [2,3,4]. It has to be pointed out however, that these percentages include a large number of micronodules (< 3 mm) and parenchymal micronodules connected to branching bronchovascular structures ("tree-in-bud" pattern). The vast majority of these nodules most probably do not represent true rheumatoid nodules.

Rheumatoid nodules, or necrobiotic nodules, are most commonly found in the subcutaneous tissues, and less commonly in the visceral organs [5]. Their pathological appearance is the same regardless of their location. The true prevalence of pulmonary necrobiotic nodules is difficult to assess because of their nonspecific CT appearance. It is estimated that they occur in less than 1% of cases. Rheumatoid nodules have classically been described to occur predominantly in subpleural regions [3].

In this poster we will illustrate the appearance pattern and evolution of RA nodules in three patients.

Findings and procedure details

Three cases of pathologically proven pulmonary rheumatoid nodules in patients with RA are presented. Relevant patient information is summarized in table 1.
Biopsy was done to exclude malignant disease. None of the three patients presented with pulmonary symptoms when the chest CT was taken. Instead, it was performed for work-up for incidentally detected pulmonary nodules on abdominal CT (n=1), or on plain chest radiographs (n=2). Musculoskeletal symptoms of RA were present in each patient. All were treated by immunomodulatory medication at the time the CT scan was performed. At the time of the first CT scan of the thorax, patient 1 was not yet treated with immunomodulatory medication, but patient 2 and 3 were treated for respectively 5 and 42 months.

Two patients had a history of smoking (n=2). There was no asbestos or other occupational exposure in any of the patients. None of the patients presented with pulmonary symptoms.

Distribution of lung nodules was random in all cases. Cavitation (n=2) and calcification (n=1) were present. Largest nodule size was between 14 and 22 millimeters. Mediastinal lymph nodes were seen in all patient without pathological enlargement (smallest axial diameter > 10 mm) (n=3), hilar lymph nodes were seen in one patient.

Patient 3 had a history of colorectal carcinoma. In case of malignancy, the presence of randomly distributed solid lung nodules is very suspicious for lung metastases. FDG-PET positivity does not help to distinguish between rheumatoid nodules and malignancy and a (CT-guided or transbronchial) biopsy has to be performed in these cases.

All patients were treated with immunomedulatory medication for their musculoskeletal symptoms. Long-term follow-up showed a clear increase in volume and number of nodules in patients 1 and 3, and limited progression in patient 2.

Images for this section:

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Table 1: Patient information. Abbreviations: VATS = video assisted thoracic surgery. MSK = musculoskeletal. M = male. F = female.
Fig. 1: 60-year-old male RA patient. (a) Plain chest radiograph shows a peripheral nodule in the left upper lung. (b) Axial CT slice after intravenous injection of iodinated contrast medium, mediastinal window. Multiple nodules are seen. The largest nodule at the midthoracic level (blue arrow) shows a prominent central calcification. The presence of a small right sided pleural effusion is also noted. (c) Axial CT slice shows the relative predominance of the nodules in the upper regions. There is a conglomerate of partially calcified nodules dorsally in the right upper lobe (blue arrowheads).
**Fig. 2:** patient 2. 65-years-old female RA patient. Axial CT images in lung parenchymal window setting. Baseline exam shows a thick-walled cavitated nodule centrally in the right upper lobe (blue arrow in a). After one month, the cavitation has disappeared, leaving behind a crescent-shaped opacity (blue arrow in b). At six months, a new nodule appears in the same area (blue arrowhead in c). Centrally in the right upper lobe, there is a partially cavitated nodule that undergoes little change between the baseline CT (green arrow in d) and one month follow-up (green arrow in e). At six months however, the cavitation has disappeared, and only the solid part of the nodule is seen (green arrow in f).
**Fig. 3:** Figure 3: patient 3. Axial CT (a and b) and FDG-PET (c) images of a pathologically proven solid rheumatoid nodule in a 73-year old female RA patient. There is moderate FDG uptake of the nodule (green arrow in c). Eight years later, there was an increase in number and volume of the lung nodules on CT (blue arrowheads in d). In e, there is still moderate uptake of multiple nodules on FDG-PET (green arrowheads), complicating the diagnosis. No enlarged lymph nodes were seen.
Conclusion

In this pictorial poster, we have documented the appearance and evolution of pulmonary rheumatoid nodules.

As also shown in our cases, rheumatoid nodules can present as solitary or multiple, solid or cavitated lesions that may spontaneously regress and very rarely calcify. Although they are classically said to occur predominantly in subpleural regions, our cases show that rheumatoid nodules can appear anywhere in the lung. Since metastatic disease cannot always be ruled out confidently based on imaging studies, CT-guided transthoracic biopsy is often necessary. Peripheral cavitated nodules may rupture and cause pneumothorax. Uncomplicated nodules require no specific treatment.

There are no imaging findings identified to be highly specific for rheumatoid nodules. Spontaneous regression of some nodules as well as the presence of cavitation may suggest the diagnosis. Calcification of rheumatoid nodules is very rare, but is possible, also in absence of occupational exposure. Rheumatoid nodules may show FDG uptake on PET imaging, so in case of suspiciousness for malignancy, a biopsy should be performed.

Personal information

References


