



CASE REPORT

A 47-year-old female with shortness of breath and “reversed halo sign”

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ABSTRACT: A 47-yr-old female was referred to a tertiary centre for further evaluation of chronic cough, fever, progressive exertional dyspnoea and fatigue. From a respiratory point of view she had been well until 7 months previously when she had started to experience systemic fatigue, low-grade fever and chronic dry cough. A computed tomography scan of the chest demonstrated diffuse bilateral ground-glass, ill-defined pulmonary opacities affecting all lobes. Some had central ground-glass hazy density with peripheral areas of increased opacity, which is consistent with “reversed halo sign”.

Cryptogenic organising pneumonia (COP) is a clinical, radiological and pathological diagnosis which is made when no definite cause, such as infection or connective tissue disease, is found. It is characterised histopathologically by the presence of patchy distribution of granulation tissue, which consists of fibroblasts and myofibroblasts embedded in a loose connective matrix, present in the lumen of the distal airspaces including alveoli, alveolar ducts and bronchioles.

This case report illustrates the association of the reversed halo sign with COP. Although only seen in one fifth of patients with the disease, it appears to suggest the diagnosis of COP and, with proper clinical correlation, it may be another diagnostic adjunct.

KEYWORDS: Chest computerised tomography, cryptogenic organising pneumonia, reversed halo sign

A 47-yr-old female was referred to a tertiary centre (St Michael’s Hospital, Toronto, Canada) for further evaluation of chronic cough, fever, progressive exertional dyspnoea and fatigue. From a respiratory point of view she had been well until 7 months earlier when she had started to experience systemic fatigue, low-grade fever and chronic dry cough. She denied any weight loss and there was no chest pain or discomfort. Her past medical history included kidneys stones 20 yrs ago which required a laparotomy, and uterine embolisation 2 yrs ago. Her current medications only included multivitamins. She is an ex-smoker with 8 pack-yrs exposure and she quit smoking 15 yrs ago. She drinks a glass of wine twice a week and has no known allergies, and has had no animal exposure and no travel history in the last few years. There is no family history or childhood history of respiratory complaints. The patient is a teacher with no obvious occupational risk factors.

On physical examination she appeared well and in no respiratory distress. No pallor, clubbing, cyanosis or jaundice was noted. The following

parameters were recorded: blood pressure of 115/75 mmHg; heart rate of 68 beats·min⁻¹; respiratory rate of 24 breaths·min⁻¹; and body temperature of 37.2°C. Her arterial oxygen saturation on room air was 95%. The jugular venous pressure was normal. Her heart sounds were normal with no murmurs or extra sounds. Chest examination revealed slightly diminished breath sounds in the right base but no crackles or wheezes were heard. Her abdominal examination was benign and there was no lymphadenopathy in any region.

Laboratory findings revealed a normal complete blood count with differential. Electrolytes, liver and renal functions were all normal. Arterial blood gases (room air) were: pH 7.35, carbon dioxide tension 36 mmHg, oxygen tension 55 mmHg, and HCO₃ 24 mmol·L⁻¹. Pulmonary function tests were normal and showed a forced expiratory volume in 1 s of 85% of the predicted value, a forced vital capacity of 90% pred and total lung capacity of 88% pred.

A chest radiograph showed multiple, small, patchy opacities throughout both lungs. A computed

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Received:

Aug 05 2009

Accepted after revision:

Sept 09 2009

PROVENANCE

Submitted article, peer reviewed.

European Respiratory Review
Print ISSN 0905-9180
Online ISSN 1600-0617

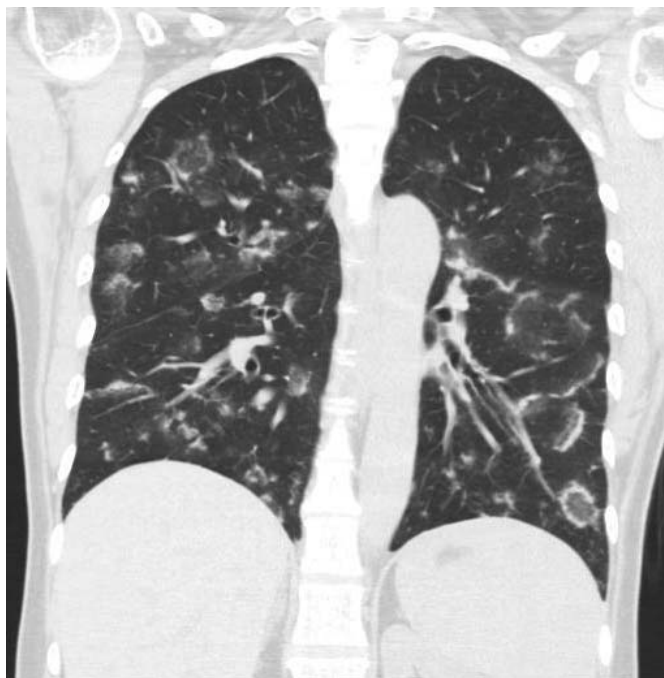


FIGURE 1. Coronal chest computed tomography scan showing multiple areas of central ground-glass opacity, surrounded by ring or crescentic-shape, dense air-space consolidation, mainly in the left lower lobe and the right upper lobe.

tomography (CT) scan of the chest was obtained (figs 1 and 2) which demonstrated diffuse bilateral ground-glass, ill-defined pulmonary opacities affecting all lobes with relative sparing of the lung apices. Some had central ground-glass hazy density with peripheral areas of increased opacity.

The patient underwent bronchoscopy with bronchoalveolar lavage and trans-bronchial biopsy, which were not diagnostic. Cryptogenic organising pneumonitis (COP) was considered most probable clinically and radiologically, but to rule out other possibilities she underwent an open lung biopsy. The pathology results were consistent with organising pneumonia

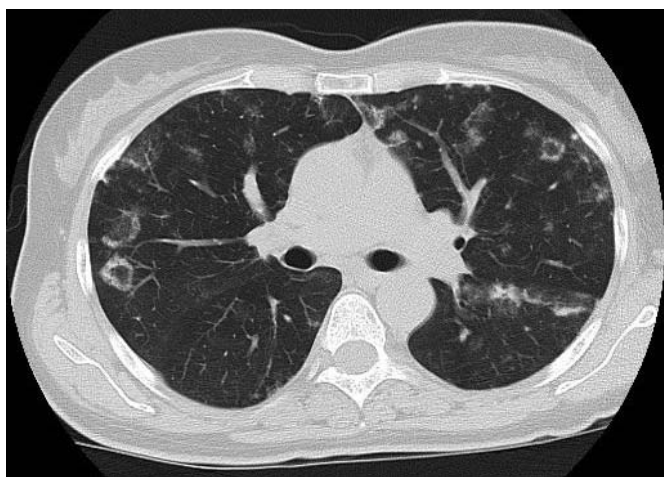


FIGURE 2. Chest computed tomography scan demonstrating central ground-glass hazy density with peripheral areas of increased opacity.

and without other possible cause, the patient was diagnosed with COP (fig. 3). She was started on prednisone treatment $1 \text{ mg}\cdot\text{kg}^{-1}$ and with tapering steroids dose she recovered over a 6-month period. A chest radiograph obtained at the follow-up visit revealed complete resolution.

DISCUSSION

A reversed halo sign on high-resolution CT (HRCT) scan is defined as central ground-glass opacity, which is surrounded by ring or crescentic-shape, dense air-space consolidation. Although KIM *et al.* [1] were the first to coin the term reversed halo sign, the association between COP and this radiological finding was first described by VOLOUDAKI *et al.* [2] who reported the CT findings of two patients with COP.

COP is the current internationally recognised terminology for bronchiolitis obliterans organising pneumonia. COP is a clinical, radiological and pathological diagnosis which is made when no definite cause, such as infection or connective tissue disease, is found. It is characterised histopathologically by the presence of patchy distribution of granulation tissue, which consists of fibroblasts and myofibroblasts embedded in a loose connective matrix, present in the lumen of the distal airspaces, including alveoli, alveolar ducts and bronchioles. It is also associated with a variable amount of interstitial and air-space infiltration of mononuclear cells and foamy macrophages [3, 4].

The typical imaging features of COP on chest radiographs comprise patchy alveolar opacities, usually bilateral, which may be migratory. They usually predominate in the lower lung zones. On HRCT, the most common finding of COP has been reported to be bilateral patchy areas of densities, which varies from ground-glass opacities to consolidation. These opacities are predominantly subpleural or in peribronchovascular distribution. Their size ranges from a few centimetres to an entire lobe. These findings, which are seen in ~60% of the patients, are nonspecific [3, 5–8].

Correlative studies using chest HRCT images with pathological samples from 20 patients with pathologically proven COP have shown that in the reversed halo sign, the central ground-glass

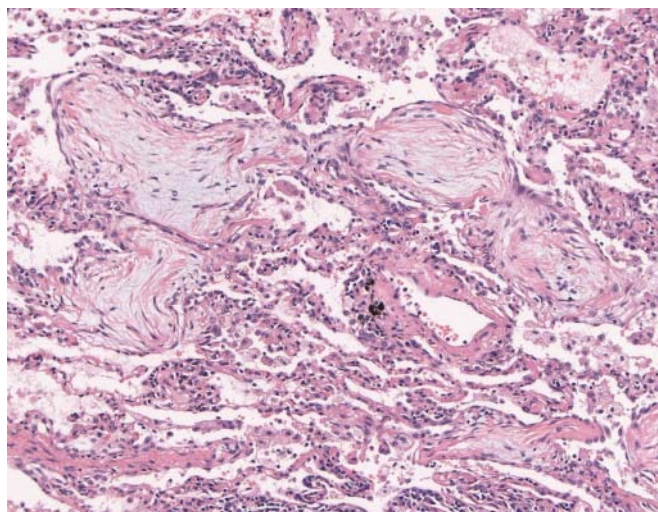


FIGURE 3. Transbronchial biopsy showing organising pneumonia.

opacity corresponds histopathologically to the area of alveolar septal inflammation and alveolar cellular desquamation with a small amount of granulation tissue in the terminal air spaces, whereas the ring-shaped or crescentic peripheral air-space consolidation corresponds to the area of intraluminal organising pneumonia and fibrosis within the distal air spaces [7, 8].

In the original study, KIM *et al.* [1] retrospectively determined the specificity of the reversed halo sign for the diagnosis of COP. They compared the radiological findings in 31 patients with biopsy proven COP with 30 organising pneumonia patients with known cause. They demonstrated that the reversed halo sign was seen in six (19%) out of 31 patients with COP and in none of the patients with non-COP. They conclude that this sign, although not sensitive, may suggest the diagnosis of COP. Since then the reversed halo sign has also been described in association with the South American blastomycosis (paracoccidioidomycosis) [9].

In conclusion, this case report illustrates the association of the reversed halo sign with COP. Although only seen in only one fifth of patients with the disease, it appears to suggest the diagnosis of COP and with proper clinical correlation it may be another diagnostic adjunct.

SUPPORT STATEMENT

N. Maimon has received grants from the Princess Margaret Hospital Foundation (Toronto, Canada) and the SACTA-RASHI Foundation (Israel).

STATEMENT OF INTEREST

None declared.

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