# **Reversed Halo Sign**

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### **Clinical Summary**

A 45-year-old human immunodeficiency virus (HIV0 negative) male, current smoker, presented with complaints of acute onset cough associated with 20 to 30 mL of black-brownish-coloured sputum for the past 15 days. Subsequently he developed exertional dyspnoea (Grade 1 mMRC [modified Medical Research Council]) accompanied with right-sided pleuritic chest pain for the last 10 days. At the onset, he also had low grade, intermittent fever without chills and rigors which lasted for five days. There was no history suggestive of sinusitis, haemoptysis and loss of weight or appetite.

## Investigations

Laboratory investigations showed a high random blood sugar and a high glycosylated haemoglobin (12.3%) and he was diagnosed to have diabetes mellitus. Complete blood count, electrocardiogram, hepatic and renal function testing were within normal limits. Chest radiograph (postero anterior view; Figure 1) showed multiple cavitatory lesions on the right side and a consolidation with irregular margins in the left parahilar region.



Figure 1. Chest radiograph (postero-anterior view) showing multiple cavitatory lesions on the right side and a consolidation with irregular margins in the left parahilar region.

Contrast enhanced computed tomography (CECT) of the chest (Figures 2A and 2B) revealed bilateral multiple cavitatory opacities. These opacities were defined as focal round area of ground-glass attenuation surrounded by a crescent or ring of consolidation [reversed halo sign (RHS)].



Figure 2. CECT chest (A) (axial view) and (B) (coronal view) showing bilateral multiple cavitatory opacities with focal round area of ground-glass attenuation surrounded by a crescent or ring of consolidation.

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Sputum examination yielded negative results for acidfast bacilli, pyogenic organisms and malignant cells. Sputum for fungus on direct microscopy showed broad, aseptate, branching hyphae with focal bulbous dilatations. The culture growth confirmed *Rhizopus oryzae* from three consecutively collected sputum samples. Fibreoptic bronchoscopy showed hyperaemic endobronchial mucosa. Culture of bronchoalveolar lavage (BAL) fluid, post-bronchoscopy sputum and the endobronchial biopsy also yielded *Rhizopus oryzae*. Overall, six consecutive samples confirmed the growth of *Rhizopus oryzae*. The patient was started on treatment with parenteral amphotericin B. However, on day 4 of treatment, the patient had an episode of massive haemoptysis and died.

**Diagnosis:** Pulmonary mucormycosis in a patient with poorly controlled late diagnosed diabetes mellitus.

#### Discussion

The timely diagnosis of invasive fungal pneumonias relies profoundly on identification of radiographic pattern in chest CT.<sup>1</sup> The CT finding of RHS has been described as a focal round area of ground-glass attenuation surrounded by a ring of consolidation.<sup>2</sup> The RHS is also known as "fairy ring sign" and "atoll sign".<sup>3</sup> In a retrospective analysis,<sup>4</sup> RHS was identified as an early sign, present in about 4% of patients diagnosed with pulmonary mold infections, usually zygomycosis. Histopathology of RHS in invasive fungal pneumonia reveals infarcted lung with a greater amount of haemorrhage in the peripheral solid ring than in the centre ground-glass region.<sup>4</sup>

The RHS has been described most commonly for COP, though not specific to it.<sup>5</sup> The other conditions where RHS has been described include pulmonary paracoccidioidomycosis, invasive pulmonary aspergillosis, lymphomatoid granulomatosis, Wegener's granulomatosis, pulmonary tuberculosis, lipoid pneumonia, pulmonary sarcoidosis, druginduced interstitial pneumonitis, cellular (NSIP) and pulmonary infarction.<sup>3,6-8</sup> In the present case, clinical and radiographic findings were suggestive and fungal culture confirmed the diagnosis of pulmonary mucormycosis. It is imperative to diagnose mucormycosis early, given that delayed treatment increases the mortality rate.<sup>9</sup>

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