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Case report

Reversed halo sign in pulmonary infarction with tumor emboli: A case report

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ABSTRACT

We describe the case of a 79-year-old woman with pulmonary infarction due to tumor emboli whose high-resolution CT (HRCT) scan demonstrated the reversed halo sign. The patient had gastric cancer and died because of cancer-related cerebral infarction. On autopsy, the central ground-glass area of the reversed halo sign on HRCT corresponded to pulmonary edema associated with alveolar septal capillary metastasis, whereas the peripheral ring-like consolidation consisted of a hemorrhagic infarct with tumor emboli. The present case is important because a detailed pathologic correlation with this unique HRCT appearance was revealed.

1. Introduction

The reversed halo sign is characterized by central ground-glass opacity surrounded by dense air-space consolidation in the shape of a crescent or ring on high-resolution CT (HRCT) scans of the chest [1]. It was initially considered specific to cryptogenic organizing pneumonia (COP) [2,3]. Since then, this sign has been reported in a wide spectrum of diseases including infectious and non-infectious conditions [4,5]. Although pulmonary infarction, often appearing as non-specific peripheral wedge-shaped parenchymal consolidation, is listed as one of the differential diagnoses of the reversed halo sign, limited information is available on the correlation of HRCT findings and pathologic findings in patients with pulmonary infarction. We report an autopsy case of pathologically proven pulmonary infarction due to tumor emboli presenting as multiple reversed halo signs.

Abbreviations: COP, cryptogenic organizing pneumonia; HRCT, high-resolution CT; KL-6, Krebs von den Lungen-6; SP-D, surfactant protein D

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2. Case report

A 79-year-old woman who did not smoke and had undergone distal gastrectomy for gastric cancer in October 2009 was admitted to our hospital in July 2011 with low-grade fever and left-sided chest pain. Physical examination revealed pale palpebral conjunctiva suggestive of anemia; coarse crackles in the left lung; and no splenomegaly, hepatomegaly, or lymphadenopathy. Oxygen saturation level was 98% (room air). Laboratory findings were as follows: white blood cells, 5210/μL; RBCs, 237×10^4/μL; Hb, 7.7 g/dL; Hct, 22.1%; platelet count, 14.3×10^4/μL; AST, 57 U/L; ALT, 18 U/L; LDH, 515 U/L; and CRP, 1.9 mg/dL. Serum Krebs von den Lungen-6 (KL-6) and surfactant protein D (SP-D) levels were 2326 U/mL (normal: <500 U/mL) and 29.9 ng/mL (normal: <110 ng/mL), respectively. Chest radiographs showed bilateral consolidation in the upper lung fields, particularly prevalent close to the pleura. Chest HRCT revealed reversed halo signs in both upper lobes combined with subpleural ground-glass opacities (Fig. 1). Analysis of bronchoalveolar lavage fluid revealed the following results: 4.0×10^5 cells/mL; neutrophils, 2.0%; eosinophils, 0%; and lymphocytes, 10.5%. The CD4/CD8 ratio of T lymphocytes was 0.41. On visual examination, bronchoalveolar lavage fluid appeared slightly bloody, and Berlin blue staining was positive. Cytopathologic examination revealed no malignant cells, and cultures were negative.

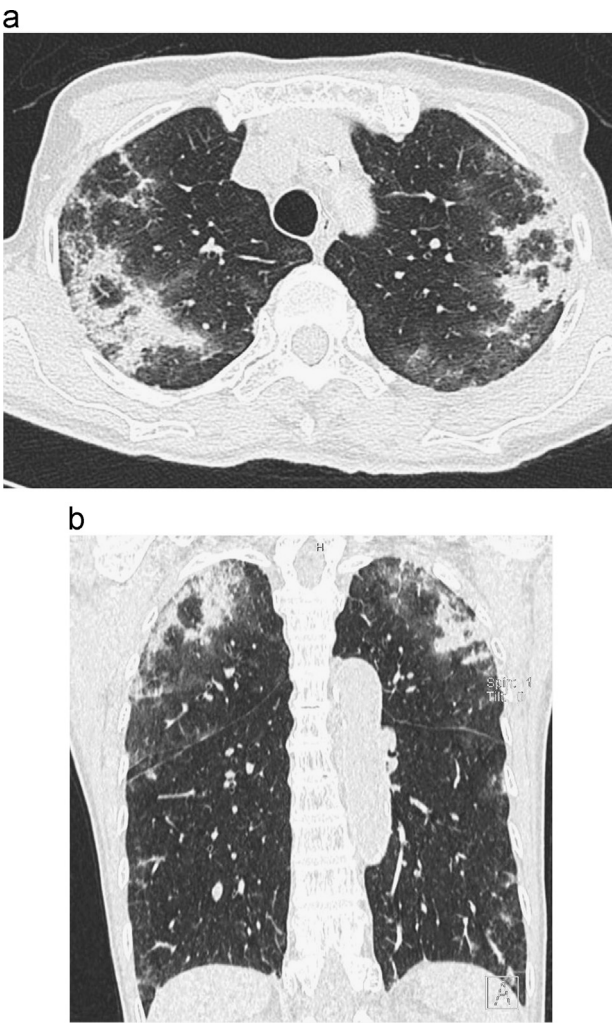

Fig. 1 – Axial high-resolution CT scan (a) and coronal reformatted image (b) at presentation show localized round and oval areas containing a central ground-glass opacity and a ring of consolidation (reversed halo sign) predominantly in both upper lobes. In addition, focal areas of ground-glass attenuation are seen.

Fig. 2 – Gross cut-surface view of the left lung on autopsy shows ill-demarcated hemorrhagic consolidations in the upper lobes.

After admission, the patient suddenly experienced paralysis of the right upper extremity. Brain magnetic resonance imaging revealed bilateral cerebral infarction of the corona radiata. Edaravone was administered, but the paralysis rapidly worsened to quadriparesis. Laboratory data showed elevation of fibrin degradation products (233 μg/mL) and a depleted platelet count (7.7×10^4/μL). Disseminated intravascular coagulation was diagnosed, and heparin therapy was initiated. However, the patient died on day 13.

At autopsy, ill-demarcated hemorrhagic consolidations, which corresponded to the reversed halo signs observed on HRCT, were noted bilaterally in the upper lung lobes (Fig. 2). Histologically, the lesion was composed of central necrotic islands surrounded by a peripheral ring-like hemorrhagic band (Fig. 3a). The pulmonary vasculature and lymphatics near the hemorrhagic band were occluded by tumor emboli (Fig. 3b). The central edematous pulmonary parenchyma indicated pulmonary edema with alveolar capillaries occluded by tumor cells (Fig. 3c). In addition, metastases were observed in the para-aortic lymph nodes, right renal retroperitoneum, bone marrow, and heart. Recurrence of the cancer was not found in the remaining stomach. The cancer cells found in the autopsy were the same as the previously resected gastric cancer cells.

3. Discussion

This patient, who had gastric cancer and died because of cancer-related cerebral infarction, had multiple reversed halo signs. Pathologic correlation of this unique HRCT appearance is scarce,

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