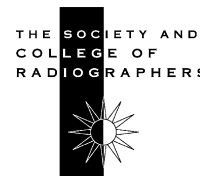




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CASE REPORT

Crazy-paving sign in high-resolution computed tomography in parainfluenza virus pneumonia

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KEYWORDS

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Abstract The crazy-paving sign is the appearance of a smooth linear pattern superimposed on an area of ground-glass opacity on thin-section computed tomography (CT). A 69-year-old woman was admitted to our hospital for treatment of pneumonia. Thoracic CT showed a crazy-paving sign in the right lung field on admission. She received ceftriaxone and clarithromycin, and the symptoms and infiltration shadow promptly disappeared. Serologic testing revealed a greater than 4-fold increase in the IgG titer for parainfluenza virus I. To our knowledge, there is no previous report of the crazy-paving sign in associated with viral pneumonia in a non-immunocompromised host or with parainfluenza pneumonia.

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Introduction

The crazy-paving sign is the appearance of a specific linear pattern on thin-section computed tomography (CT) images of the lungs. The sign comprise an area of scattered or diffuse ground-glass attenuation with superimposed interlobular septal thickening and intralobular lines.^{1–3} The

crazy-paving sign was initially recognized in patients who had pulmonary proteinosis.^{1–3} This finding has a variety of causes, including infectious, neoplastic, idiopathic, inhalational, and hemorrhagic disorders. Of the causative infectious diseases, *Pneumocystis jiroveci* pneumonia is most common and bacterial infection has also been reported.^{1,2} There is no previous report of a virus-associated crazy-paving sign in a non-immunocompromised host, although its appearance in association with a virus has been reported in immunocompromised hosts.^{4,5} The appearance of the crazy-paving sign on thoracic high-resolution CT of a patient with parainfluenza virus (PIV) pneumonia has not been described.

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Case report

A 69-year-old woman was admitted to our hospital for treatment of pneumonia. One week before admission, the patient developed a fever and cough and presented to the clinic for consultation. She was diagnosed with bronchitis and azithromycin was prescribed (500 mg/day, one times daily for 3 day), but the low grade fever and cough persisted. Three days before hospital admission, she developed a high fever (40 °C), sputum, and nasal discharge. One day before admission, she again visited the clinic and was diagnosed with pneumonia and prescribed levofloxacin (200 mg/day, two times daily).

Physical examination revealed a temperature of 38.6 °C and blood pressure of 120/86 mmHg. Lung auscultation revealed no rales. The white blood cell count was 6.67×10^3 with 81.1% neutrophils. C-reactive protein was 11.87 mg/L (normal range [N]: 0.0–0.3). Arterial blood gases were as follows: pH 7.452, HCO₃ 21.6 mmol/l, pCO₂ 31.6 mmHg, pO₂ 82.8 mmHg, and base excess –1.3 mmol/l. Thoracic CT revealed the crazy-paving sign of right lung field (Fig. 1) and ground-glass opacities in the right lower lung field. Gram and acid-fast stains of the sputum were negative. She received ceftriaxone and clarithromycin. The symptoms and infiltration shadow promptly disappeared. Culture of the sputum yielded no bacterial, fungal, or acid-fast bacillus growth. Serologic tests for *Mycoplasma* and *Chlamydia pneumoniae* were negative. The patient was discharged after 9 days of hospitalization. We retrospectively analyzed the anti-PIV (types 1–3), influenza virus (type A, B), adenovirus, and respiratory syncytial virus antibody titers and found a greater than 4-fold increase in the anti-PIV type 1 antibodies between the sera obtained on admission and that obtained 2 weeks after the admission (Table 1).

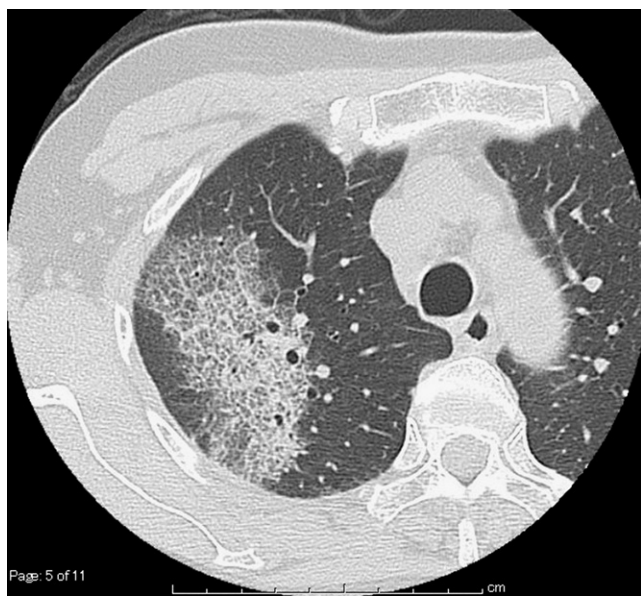


Figure 1 Chest CT demonstrated crazy-paving sign in right lung field.

Table 1

	On admission	Two weeks later
<i>Influenza A</i>		
H1N1	×80	×80
H3N1	×160	×320
<i>Influenza B</i>		
	×40	×40
<i>Parainfluenza</i>		
1	×40	×320
2	×10	×10
3	×80	×80
<i>Adenovirus</i>		
	×4	×4
<i>Respiratory syncytial virus (RS virus)</i>		
	×4	×4

Discussion

Viruses account for a substantial number of cases of community-acquired pneumonia (CAP), ranging from 2% to 35%.⁶ Influenza A and respiratory syncytial virus are the most common causes of viral pneumonia, followed by adenovirus, PIV types 1, 2, and 3, and influenza B.^{6,7} In addition, human metapneumovirus, three new human coronaviruses (severe acute respiratory syndrome-associated coronavirus, coronavirus HKU1, and coronavirus NL96), and the H5N1 strain of the influenza virus can cause pneumonia.^{6,7}

Viral pneumonia in adults may be classified into two clinical groups: so-called atypical pneumonia in otherwise healthy hosts, and viral pneumonia in immunocompromised hosts. PIV infection is the one of the leading causes of morbidity and mortality after hematopoietic stem cell transplantation (HSCT),^{8,9} although PIV pneumonia is very rare in healthy adults. Early, accurate diagnosis of pulmonary complications following HSCT is important because of its high mortality and morbidity. High-resolution CT is important for early diagnosis of pulmonary disease following HSCT.⁵ Several CT findings of PIV pneumonia have been described in patients following HSCT. Patricia et al. reported the CT findings in 6 HSCT patients with PIV pneumonia who had multiple small nodules without cavitation with a peribronchial distribution.⁸ There are no previous reports, however, of CT findings of PIV pneumonia in non-immunocompromised host. This is the first report of CT findings of parainfluenza pneumonia in a non-immunocompromised hosts.

The crazy-paving sign is not commonly observed. It is a nonspecific finding observed in CT images in a variety of intestinal and airspace lung diseases. The networks in the areas with a crazy-paving appearance are not necessarily due to thickening of intralobular septa or the presence of intralobular fibrosis. The appearance can also be caused by an airspace disease, where the appearance is due to a linear deposition of material within the airspace.^{1,3} In a CT-pathologic correlation of adenovirus pneumonia in a patient with non-Hodgkin's lymphoma, a crazy-paving sign observed on HRCT corresponded histopathologically to an area of diffuse alveolar damage with mixed exudative and proliferative phases.⁴ The crazy-paving sign on CT in viral pneumonia has been reported in immunocompromised hosts. The appearance of the crazy-paving sign in CT image of the lungs of non-immunocompromised patients with viral

pneumonia, however, has not been described previously. The possibility of PIV pneumonia should be considered upon observation of the crazy-paving sign on CT.

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