
SPECIAL CONTRIBUTION

Radiological Appearances of Severe Acute Respiratory Syndrome

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ABSTRACT

Recently, there has been an outbreak of severe acute respiratory syndrome in Hong Kong. Various radiological appearances, including chest X-ray and computed tomography, at the time of diagnosis, and the imaging protocol for suspected cases are reviewed in this article.

Key words: Radiography, Severe acute respiratory syndrome, Tomography X-ray computed

INTRODUCTION

Since March 2003, there has been an outbreak of atypical pneumonia in Hong Kong. The available evidence suggests that the mode of transmission is most consistent with droplet spread through respiratory secretions. Currently, both metapneumovirus and corona virus have been implicated as causative agents. Of 147 patients treated at the Prince of Wales Hospital (PWH), all have radiological evidence of pneumonic changes. This article highlights important imaging features and characteristics through the presentation of 4 patients.

CASE 1

A 44-year-old health care worker presented with a 2-day history of fever, chills, and rigor. She was tired-looking at general examination and had a high fever (38.5°C) at admission to hospital. There were localised coarse crepitations in the right lower zone at physical examination. Frontal chest X-ray showed an ill-defined area of air-space opacification in the periphery of the right mid-zone (Figure 1). There was no cavitation,

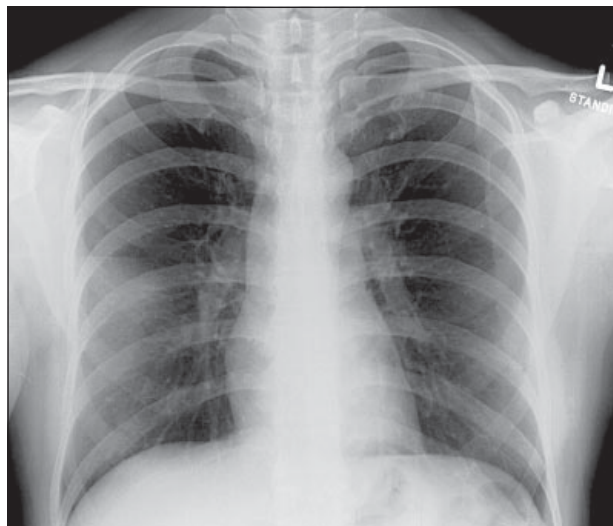


Figure 1. Frontal chest X-ray of a 44-year-old woman with severe acute respiratory syndrome, showing ill-defined air space opacification in the periphery of the middle lobe superiorly abutting the horizontal fissure. There is no cavitation, hilar lymphadenopathy, or pleural effusion.

hilar enlargement, or pleural effusion. The patient was treated with an oral antiviral agent and corticosteroid. The fever and biochemical parameters gradually improved.

CASE 2

A 44-year-old health care worker who had had contact with patients with atypical pneumonia 3 days earlier presented with abrupt onset of fever, chills, and myalgia.

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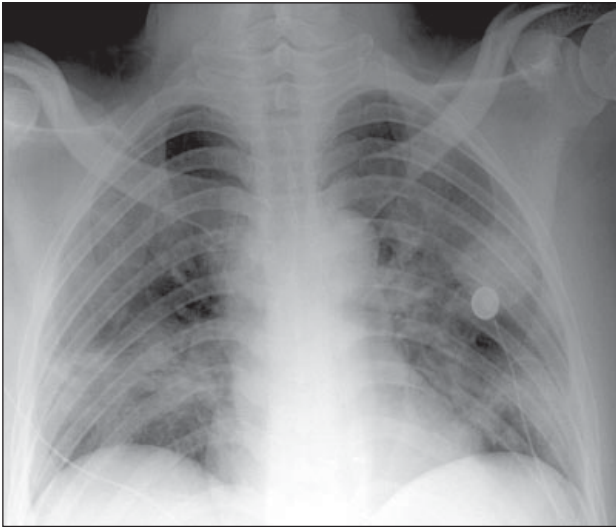


Figure 2. Frontal chest X-ray of a 44-year-old man with severe acute respiratory syndrome showing multi-focal ill-defined air space opacities in the periphery of the left mid-zone and both lower zones.

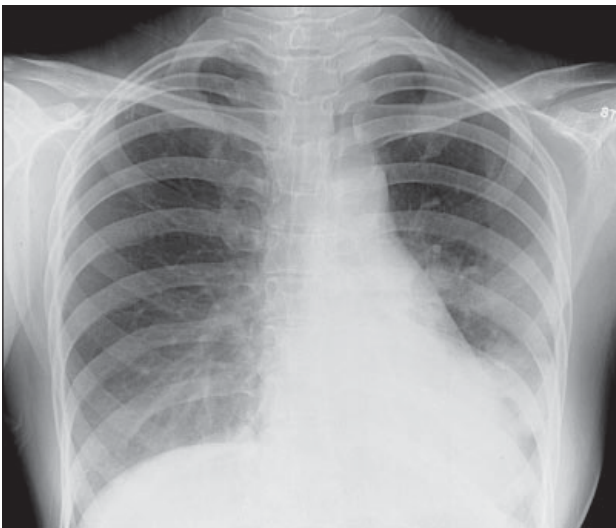


Figure 3. Frontal chest X-ray of a 23-year-old woman with severe acute respiratory syndrome showing ill-defined air space opacity in the lingular segment obscuring part of the left heart border. The initial chest X-ray 2 days previously was normal.

He initially refused hospital admission but was subsequently admitted after 4 days of worsening symptoms. He was tachypnoeic and hypoxic on room air (arterial oxygen percent saturation, 88% on room air) at physical examination. Laboratory investigations revealed lymphopenia and thrombocytopenia. Frontal chest X-ray showed multi-focal ill-defined areas of consolidation in both lungs (Figure 2). No hilar enlargement or pleural effusion was present. His condition was unstable and required admission to intensive care and close monitoring despite treatment with an antiviral agent and corticosteroid. The patient is currently showing signs of recovery.



Figure 4. Computed tomography of a 46-year-old man with severe acute respiratory syndrome showing a small area of consolidation in the periphery of the right upper lobe. Chest X-ray taken on the same day is unremarkable.

CASE 3

A 23-year-old medical student with a history of recent contact with an infected patient presented with fever, chills, rigor, and myalgia for 1 day. Laboratory investigations revealed lymphopenia and thrombocytopenia. Initial frontal chest X-ray was clear. A repeat chest X-ray 2 days later revealed peripheral consolidative changes in the left lower zone (Figure 3). She was treated with an antiviral agent and corticosteroid and steadily improved.

CASE 4

A 46-year-old health care worker who had had recent contact with a patient with suspected infection presented with a 2-day history of fever, chills, and rigors. Initial frontal chest X-ray was normal. However, in view of the strong clinical suspicion, computed tomography (CT) was performed, which showed a peripheral area of consolidation in the right upper lobe (Figure 4). He was treated with an antiviral agent and corticosteroid.

DISCUSSION

In accordance with World Health Organization, symptoms and signs of severe acute respiratory syndrome (SARS) include:

- high fever (>38°C) and
- one or more respiratory symptoms including cough, shortness of breath, difficult breathing and
- close contact with a person who has been diagnosed with SARS — close contact means having cared for, having lived with, or having had direct contact with respiratory secretions or body fluids of a person with SARS.

In addition to fever and respiratory symptoms, SARS may be associated with other symptoms including: myalgia, headache, muscle stiffness, loss of appetite, malaise, confusion, rash, and diarrhoea.

In our experience, most patients have radiological evidence of pneumonic changes at the time of diagnosis. Small unilateral peripheral air-space opacification is the most common abnormality and can be seen on chest X-ray at diagnosis. There has been no cavitation, hilar lymphadenopathy, or pleural effusion in any of the patients treated at the PWH. For some patients, although the clinical history is strongly suggestive of SARS, the initial chest X-ray may be normal. However, CT or high-resolution CT (HRCT) at this time consistently demonstrates pneumonic changes in the lung (Figure 5) and similar changes are seen on X-ray a few days later. Over

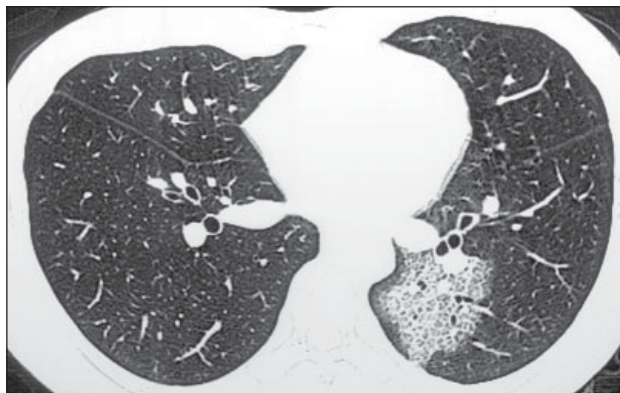


Figure 5. High-resolution computed tomography of a 37-year-old patient with severe acute respiratory syndrome showing an area of ground glass opacification in the peripheral portion of the apical segment of the left lower lobe.



Figure 6. High-resolution computed tomography of a 53-year-old patient with severe acute respiratory syndrome, showing multi-focal areas of consolidation in the periphery of both upper and lower lobes. The pattern of distribution is similar to that of bronchiolitis obliterans organising pneumonia.

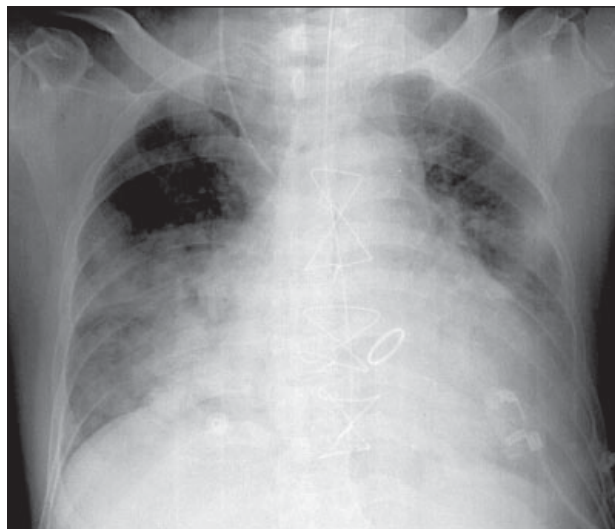


Figure 7. Frontal chest X-ray of a 59-year-old man with underlying valvular heart disease, now diagnosed with severe acute respiratory syndrome showing diffuse confluent areas of consolidation in both lungs.

time all of the patients at the PWH show radiological evidence of the disease. For patients whose diagnosis or treatment is delayed, radiological progression to multi-focal infiltrates with bilateral lung involvement appears to be usual. On HRCT, the typical appearance is of multiple patchy areas of ground-glass like opacification or consolidation with a peripheral distribution in both lungs, similar to the pattern seen in bronchiolitis obliterans organising pneumonia (Figure 6). For patients who are not responsive to treatment, there would be progressive confluent pulmonary infiltrates affecting both lungs (Figure 7).

At the PWH, chest X-ray is the initial imaging investigation for all patients who are suspected to have SARS. If chest X-ray is positive, no further imaging is required for diagnosis. Serial chest X-rays are done to help monitor treatment progress. If the initial chest X-ray is negative, HRCT is performed for patients if there is a high clinical index of suspicion. If CT is positive, treatment is immediately instituted while, if CT is negative, the diagnosis is less likely and the patient is observed.

CONCLUSION

Unilateral peripheral air-space opacity with progression to multi-focal bilateral lung infiltrates is the most commonly seen radiological pattern on chest X-ray. In patients for whom there is a high clinical suspicion but negative chest X-ray, HRCT scan detects lung parenchymal changes earlier. The role of imaging is mainly to provide radiological evidence for diagnosis and help monitor treatment progress.