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CASE REPORT

Herpes simplex virus pneumonia following mitral valve replacement

Akiko Yamaguchi, MD · Shigekiyo Matsumoto, MD
Satoshi Hagiwara, MD, PhD · Chihiro Shingu, MD
Hideo Iwasaka, MD, PhD
Takayuki Noguchi, MD, PhD

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Abstract We describe a rare case of a 79-year-old woman who developed herpes simplex virus pneumonia after mitral valve replacement. The patient showed persistent hypoxemia with bilateral glass-like shadows on chest radiography. Cytopathology examination of intratracheal secretions revealed herpes simplex virus infection. The patient, who improved gradually after acyclovir administration, was taken off the ventilator completely. Physicians should consider viral pulmonary infection to be a potential cause of unexplained hypoxemia that does not respond to conventional antibiotic treatment in critically ill, immunocompromised patients.

Key words Hypoxemia · Viral pulmonary infection · Cardiovascular surgery · Herpes simplex virus infection · Pneumonia

Introduction

Herpes simplex virus (HSV) can cause pneumonia in immunocompromised patients with severe burns, sepsis, advanced cancer, poorly controlled diabetes mellitus, or acquired immunodeficiency syndrome.[1,2] However, clinical reports of HSV pneumonia after cardiac surgery are rare.[3–5] We report a patient who was diagnosed with HSV pneumonia and successfully treated with acyclovir during the postoperative period of mitral valve replacement (MVR).

A. Yamaguchi (✉) · S. Matsumoto · S. Hagiwara · C. Shingu · H. Iwasaka · T. Noguchi
Department of Anesthesiology and Intensive Care Medicine, Faculty of Medicine, Oita University, 1-1 Hasamamachi, Yufu, Oita 879-5593, Japan
Tel. +81-97-586-5943; Fax +81-97-586-5949
e-mail: akiy1972@med.oita-u.ac.jp

Case

A 79-year-old woman underwent emergent MVR using cardiopulmonary bypass (CPB) for acute mitral regurgitation caused by acute myocardial infarction. Although the patient had a past medical history of arrhythmia and hypertension, she had no history of diabetes mellitus or steroid administration.

After surgery, we started the administration of antibiotics (imipenem-cilastatin sodium 0.5 g twice a day) to prevent infection. On admission, chest radiography showed pulmonary congestion caused by acute cardiac failure (Fig. 1A). Because of circulatory instability with potentially fatal arrhythmia, the patient required intraaortic balloon pump support from postoperative day (POD) 1 to POD 8. At first, we believed that the hypoxemia [alveolar partial pressure of oxygen/fraction of inspired air ratio (PaO_2/FIO_2) < 150] was based on low cardiac output; however, the PaO_2/FIO_2 values did not change after circulation had improved (Fig. 2). Chest radiography on POD 12 showed glass-like shadows in the bilateral upper lung fields (Fig. 1B). Moreover, chest computed tomography (CT) revealed dorsal ground-glass opacities with consolidation (Fig. 3A).

Despite the use of broad-spectrum antibiotics (imipenem-cilastatin sodium 0.5 g twice a day) based on the likelihood of bacterial infection, the symptoms and chest radiological findings did not improve. Contrary to our initial expectations, sputum, urine, and blood cultures demonstrated no growth of bacteria. On POD 12, as the patient showed signs of herpes labialis, intratracheal

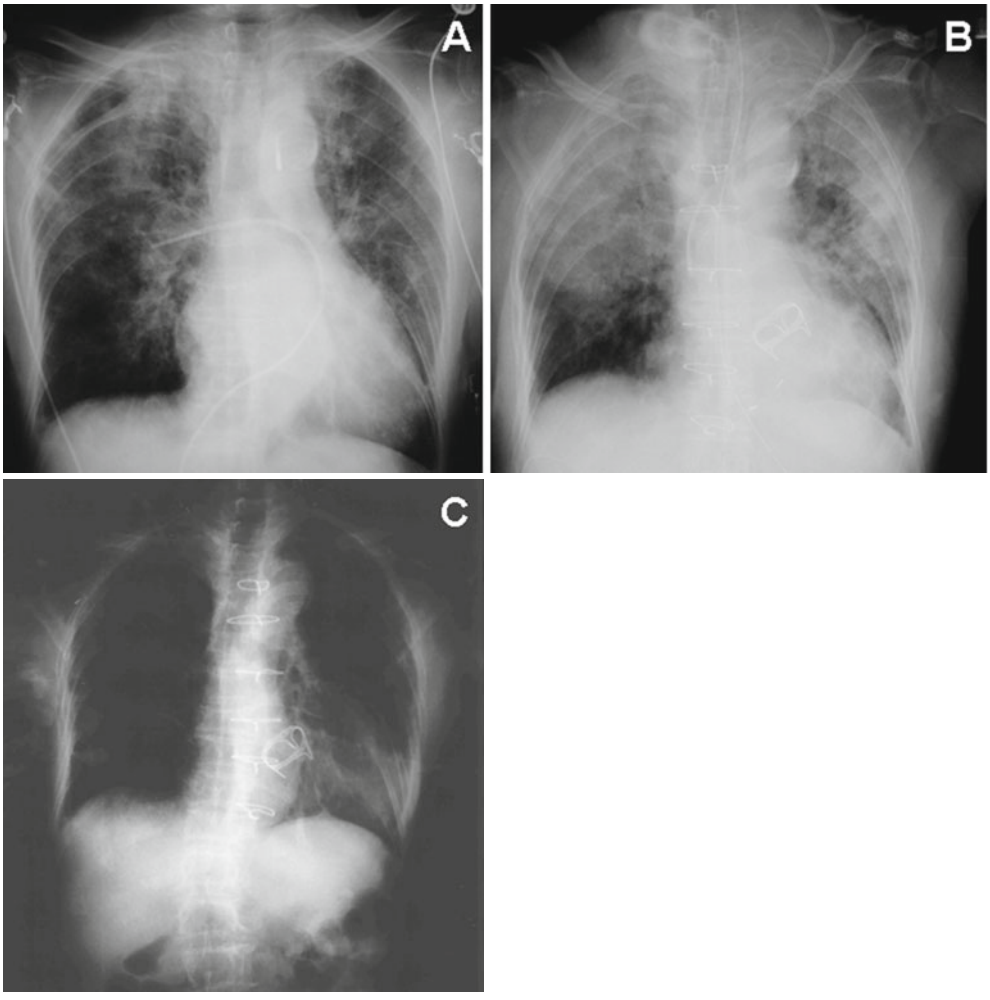

Fig. 1 Radiographic findings after admission to the intensive care unit (ICU). **A** Chest radiograph shows pulmonary congestion upon admission. **B** Chest radiograph shows glass-like shadows in bilateral upper lung fields on postoperative day (POD) 12. **C** Marked improvement was seen regarding chest infiltration on POD 40

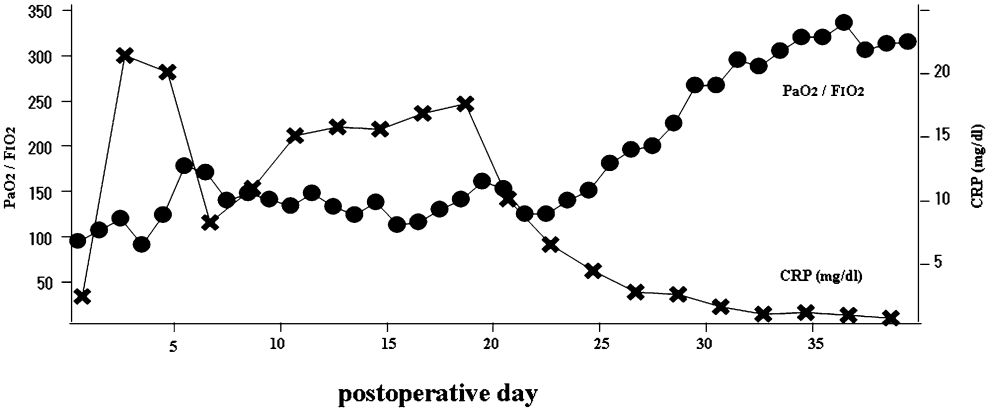

Fig. 2 Changes in C-reactive protein (CRP) levels and the alveolar partial pressure of oxygen/fraction of inspired air (PaO_2/FIO_2) ratio in the patient following ICU admission. *Black filled circles*, PaO_2/FIO_2 ratios; ×, CRP levels

secretions were obtained specifically for cytopathological examination. Cytology showed the presence of cells with ground-glass intranuclear changes and acidophilic intranuclear inclusions (Fig. 4A), which indicated a herpes virus infection. A herpes simplex virus (HSV) infection was confirmed by immunostaining of HSV in a specimen of intratracheal secretions (Fig. 4B). Also, the HSV complement fixation titer in blood was ×32 on POD 12 and increased to more than ×128 on POD 19, which indicated viral reactivation. Other viral complement fixation titers (cytomegalovirus, adenovirus, respiratory syncytial virus, varicella zoster virus) were not increased. In addition, neither *Candida* nor *Aspergillus* antigen was detected in the serum.

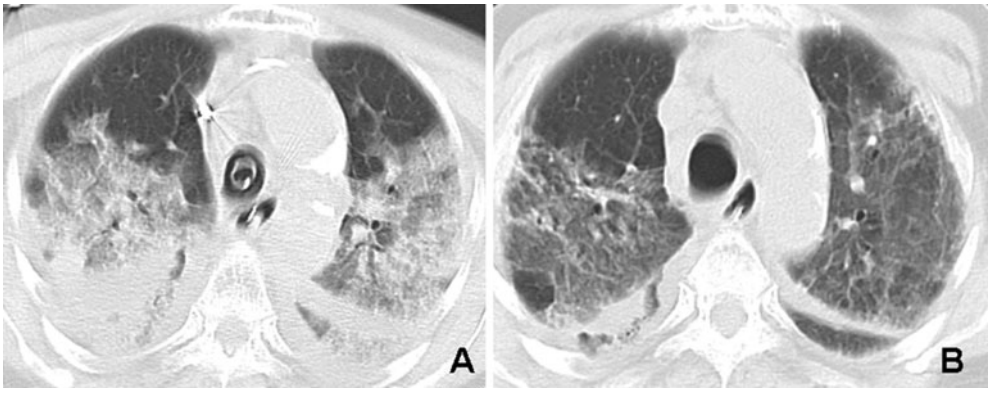

Fig. 3 Chest computed tomography (CT) findings in the patient following ICU admission. **A** Chest CT shows dorsal ground-glass opacities with consolidation on POD 12. **B** Consolidation shadows were diminished on POD 35.

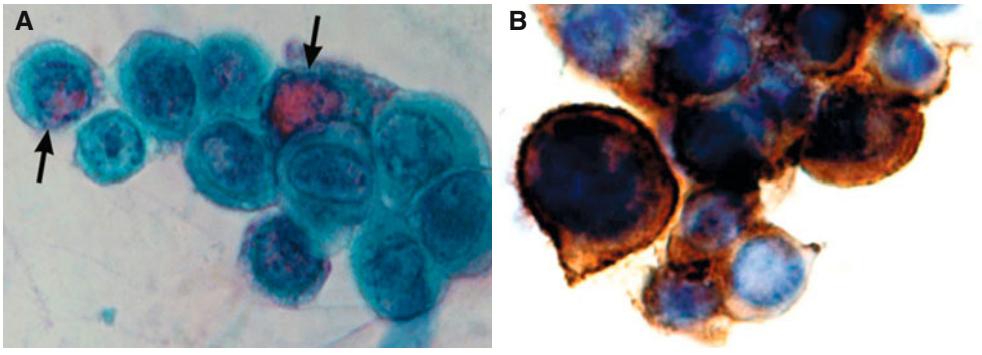

Fig. 4 Detection of herpes simplex virus (HSV) infection in intratracheal secretions. **A** HSV-infected cells exhibit ground-glass intranuclear changes and acidophilic intranuclear inclusions (*arrows*). **B** HSV immunoreactivity is observed in the nuclei and cytoplasm

Acyclovir (15 mg/kg/day for 14 days) was started on POD 13. In addition, we changed antibiotics from imipenem-cilastatin sodium to ciprofloxacin (300 mg twice a day) and clindamycin (600 mg twice a day) to prevent bacterial infection. These antibiotics were administered until POD 26. Cells in the sputum were negative for HSV infection on POD 40. PaO_2/FIO_2 values started to improve gradually from POD 20 (Fig. 2). On POD 35, consolidation shadows were diminished by chest CT (Fig. 3B), and the patient was successfully withdrawn from a ventilator on POD 40. Chest infiltration, seen radiologically, improved markedly (Fig. 1C). On POD 41, the patient was discharged from the intensive care unit (ICU).

Discussion

The HSV can cause a variety of infections involving mucocutaneous surfaces, the central nervous system, and visceral organs.[6] Clinical reports of HSV pneumonia, which has been associated with a high mortality rate, are not frequent. Furthermore, the pathogenesis of HSV pneumonia is not completely understood. HSV may reach the lower respiratory tract by reactivation of virus in the lung or trachea, depending on the presence of HSV in the superior cervical and vagal ganglia.[7] Alternatively, the virus may be asymptomatically shed in the mucocutaneous surface, followed by aspiration to the lower respiratory tract. Bruynseels and colleagues reported that the incidence of HSV in the respiratory tracts of patients in ICUs was higher than that in healthy individuals.[8] Although the route of infection in our patient was not clear, the presence of herpes labialis was helpful in recognizing the specific viral pathogen.

Pulmonary damage by HSV has been reported mostly in immunocompromised patients with burns, sepsis, advanced cancer, poorly controlled diabetes mellitus, or acquired immunodeficiency syndrome.[1,2] Reports of HSV pneumonia following open-heart surgery involving CPB are rare.[3–5] CPB changes cell-mediated immunity, reducing the number of CD4+ T cells and increasing the CD8+ T cells.[9,10] Therefore, patients who undergo cardiac surgery involving CPB should be treated as transiently immunocompromised hosts. In the case of our patient, the causative factors of HSV pneumonia likely include the age of the patient, the possibility of depressed cell-mediated immunity after CPB, and circulatory instability due to potentially fatal arrhythmia during the early postoperative period.

Although patients with HSV pneumonia have fever, cough, dyspnea, and hypoxemia, there are no typical symptoms. Furthermore, radiological and laboratory findings are not specific to the disease or pathogen.[11]

Awareness of unusual types of pneumonia, such as HSV pneumonia, may be important in the treatment of immunocompromised patients with unexplained respiratory symptoms.

HSV pneumonia can be detected by cytopathological examination of bronchoalveolar lavage or intratracheal secretions.[12,13] Characteristic cytological and histological changes, such as intranuclear inclusions, usually are achieved within 24–48 h. Immunostaining with anti-HSV antibodies should be performed to confirm the diagnosis.[12,13] Viral culture and paired antibody titers are also useful for diagnosis. Recently, the polymerase chain reaction (PCR) has been utilized, providing a faster (i.e., approximately 24 h) diagnostic technique with high sensitivity and specificity.[4,5,14] In the near future, PCR may become the gold standard used to diagnose HSV pneumonia.

Conclusion

Physicians should consider viral pulmonary infection as a potential cause of unexplained hypoxemia that does not respond to conventional antibiotic treatment in critically ill, immunocompromised patients. Early, appropriate diagnosis and treatment are important for good patient outcomes in cases of HSV pneumonia.

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