A 9-year-old girl with Kawasaki disease and pulmonary nodules

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Presentation

A 9-year-old girl was referred for low-grade fever, posterior cervical pain, maculopapular rash, erythema of pharyngeal mucosa, and bilateral conjunctival injection on 28 January 2020. The remaining examination was unremarkable, including auscultation, meningeal irritation signs, cervical lymphadenopathy, and extremity changes. She and her family had no travel history. Laboratory data showed slightly elevated white blood cell (WBC) count $9.7 \times 10^9/\text{L}$ and C-reactive protein (CRP) levels 3.3 mg/L. She scheduled a follow-up visit for 3 days' time but returned later that evening complaining of chest pain. A chest radiograph showed no apparent findings, and she went home. The next day, she revisited our hospital due to a high-grade fever, neck pain, and cough. Rapid antigen tests for group A streptococcus, adenovirus, and influenza A/B were negative. Repeated blood tests showed elevated WBC count $13.4 \times 10^9/\text{L}$ and CRP levels 82.0 mg/L; therefore, she was admitted for further examination.

Contrast-enhanced computed tomography (CT) on the second hospital day revealed no abnormalities in the neck region, but pulmonary nodules, pleural and pericardial effusion, and gallbladder hydrops were identified (Fig. 1a). Serum antibodies against Epstein-Bar virus, cytomegalovirus, and parvovirus B19 showed uninfected pattern. Blood culture and cryptococcal half quantity test

were negative. Therefore, she was diagnosed with an incomplete Kawasaki disease (KD). We administrated intravenous immunoglobulin single-dose 2 g/kg and aspirin 50 mg/kg/day and her symptoms and laboratory results rapidly improved. Her pericardial effusion gradually decreased, with no coronary artery abnormalities detected. On the thirteenth hospital day, follow-up CT resolved the findings (Fig. 1b), and serum mycoplasma pneumoniae particle agglutination antibody titer was not elevated.

Discussion

Pulmonary nodules are described as sub-symptom in the American Heart Association scientific statement on KD, as well as pericarditis and gallbladder hydrops [1]. There have only been seven reported cases of infants affected by pulmonary nodules associated with KD, all of which also presented with coronary artery involvement [2–5]. Histological study of the nodules showed inflammatory-cell infiltration as is seen in coronary artery aneurysms in patients with KD [2]. Rapid involution of pulmonary nodules via standard KD treatment may reflect the inflammatory nature of the lesions. We believe that the involvement of severe acute respiratory syndrome coronavirus 2 was quite low because she was brought to our

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Fig. 1 **a** CT scan of the chest abdomen showed pulmonary nodules with a halo sign, pleural and pericardial effusion, and acalculous gallbladder hydrops. **b** Twelve-day follow-up CT showed the disappearance of pulmonary nodules and fluid retention

hospital in late January 2020 when the coronavirus disease epidemic was not yet in Japan. KD should also be considered as a differential diagnosis in patients presenting with acute febrile illness with pulmonary nodules, even in older children.

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Authors' contributions All authors contributed to the treatment, conception, and design. The first draft of the manuscript was written by Yousuke Higuchi and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Compliance with ethical standards

Disclosures None.

Ethics approval All procedures performed in this study were in accordance with the ethical standard of National Hospital Organization Okayama Medical Center and with the 1964 Helsinki declaration and its later amendments. IRB approval was waived.

Consent for publication We obtained written informed consent from the patient and her parents for publication of this case report together with any accompanying images.

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