



# Scrub typhus with complications of acute myocarditis and cardiac tamponade in metropolitan areas: two case reports

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Scrub typhus is known as one of the most common seasonal infections in endemic rural areas, but life-threatening cardiac complications in cases of scrub typhus are very infrequent. In addition, scrub typhus infection has been rarely reported among workers assembling pallets using manufactured wood in metropolitan areas. Herein, we present two cases involving myocarditis and cardiac tamponade as complications of scrub typhus. One patient died and the other patient survived. These cases indicate that scrub typhus infection could be an environmental hazard in metropolitan areas, especially in locations with poor hygiene, and highlight the need for timely diagnosis and proper management of severe scrub typhus infections. Therefore, we present these two informative fatal cases of scrub typhus infection presenting with myocarditis and cardiac tamponade as an environmental hazard in metropolitan areas.

**Keywords:** Cardiac tamponade; Case reports; Public health; Scrub typhus

## Introduction

Mite-borne scrub typhus is geographically distributed in the rural area and a median incidence of 4.6/100,000, a mortality rate of 6.0% among those untreated, and 1.4% among those treated has been reported [1]. Based on the pathophysiology, scrub typhus invades blood vessels in the host's body, causing generalized vasculitis in major organs which results in various complications [2-4]; pneumonitis, hepatitis, and meningoencephalitis are relatively common, whereas cardiac complication including myocarditis or cardiac tamponade is unusual [5-7]. Environment assembling pallets using manufactured wood in the metropolitan show two unusual complications of fatal myocarditis and cardiac tamponade, who is the first documented carpentry-related environmental hazard due to scrub typhus infection.

## Cases

**Ethical statements:** Informed consent was waived from the patients to participate in the study (EMC IRB 2017-10-006) and case report (EMC IRB 2023-01-010).

### Case 1

A 56-year-old man visited the emergency unit on November 2, 2015. His heart rate and body temperature were 130 beats/min and 39.1 °C, respectively. The physical examination revealed a 1×1 cm necrotic skin lesion with an erythematous rim in the right axilla, and several erythematous maculopapular lesions on his trunk, right side of the neck, and on both arms. An electrocardiogram (ECG) showed sinus tachycardia (heart rate, 124 beats/min) with left ventricular hypertrophy and biochemical results included

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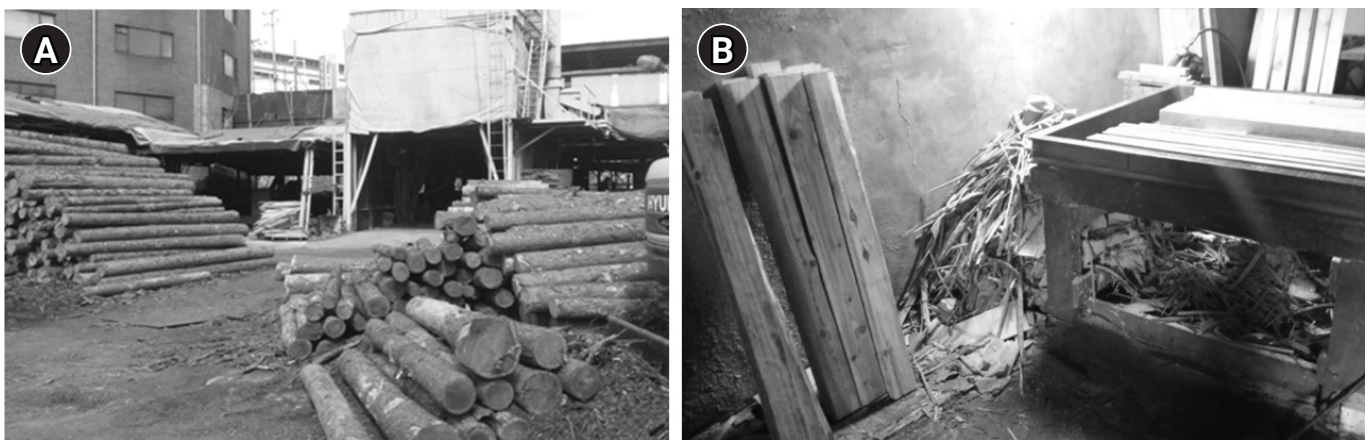
aspartate transaminase (AST) level of 228 IU/L, alanine aminotransferase (ALT) level of 130 IU/L, creatine kinase level of 1,204 IU/L, C-reactive protein (CRP) level of 6.34 mg/dL. An immunochromatographic assay for scrub typhus was positive, and immunofluorescent antibody IgG titer against *Orientia tsutsugamushi* was 1:1,280. On the 5th day of treatment with intravenous azithromycin, he complained of aggravated dyspnea. Vital signs were stable, but the chest X-ray revealed haziness in the lower lobes, bilaterally. An echocardiogram revealed severe left ventricular systolic dysfunction (ejection fraction: 13% with diffuse global hypokinesia). A chest computed tomography confirmed bilateral pleural effusions, and cardiac magnetic resonance imaging revealed dilated cardiomyopathy. Coronary computed tomography angiography showed no evidence of significant luminal narrowing. The patient was diagnosed with scrub typhus-associated myocarditis according to the diagnostic criteria for clinical myocarditis from the consensus and guidelines [8]. The patient presented unstable vital signs showed a blood pressure 80/60 mmHg, heart rate of 132 beats/min, respiratory rate of 31 breaths/min, and body temperature of 37 °C. Arterial blood gas analysis revealed severe metabolic acidosis; blood pH was 7.18, PaCO<sub>2</sub> 13.0 mmHg, PaO<sub>2</sub> 114.0 mmHg, HCO<sub>3</sub><sup>-</sup> 4.9 mEq/L, and base excess -20.7 mEq/L. Furthermore, N terminal pro-brain natriuretic peptide and D-dimer levels were elevated to 27,157 pg/mL and 1.62 µg/dL, respectively. The white blood cell count was 1,290/µL and CRP was 15.43 mg/dL and liver enzymes were elevated

with AST 188 IU/L, ALT 169 IU/L. Cardiogenic shock was clinically suspected and urgent extracorporeal membrane oxygenation with inotropic agents was applied in the intensive care unit, however, the patient expired due to cardiac death the next day.

On the medical records, an insect bite was reported at his workplace on October 26, 2015. No outdoor activities such as gardening/farming, landscaping or traveling to a rural area were reported in the preceding couple of months. He had been assembling pallets using processed wood for 2 years and wild logs were piled up adjacent to his workplace (Fig. 1A). In addition, poor hygiene as well as insect vectors and rats were present in the metropolitan (Fig. 1B).

## Case 2

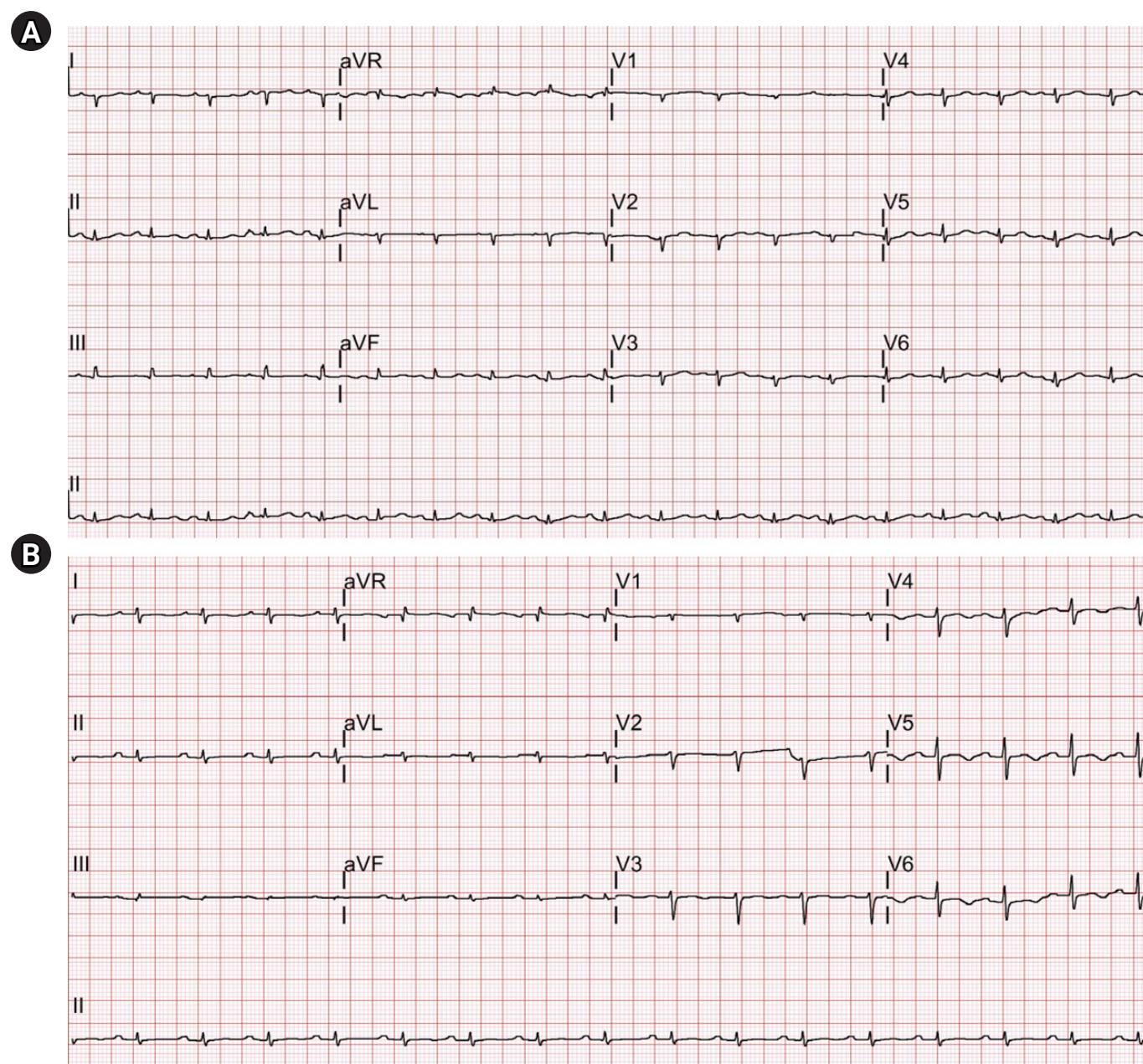
A 39-year-old woman was referred with an intermittent fever that became progressively worse. She periodically handled the wild log in the poor hygiene workplace of metropolitan as a carpenter for few months. Her vital signs were as follows: blood pressure 90/50 mmHg, body temperature 38.4 °C, pulse 132 beats/min, respiratory rate 20 breaths/min, and clear consciousness. On physical examination, she had no skin rash but, dark red crust presenting suspicious eschar was detected on the left lower abdominal wall. On the biochemical test, white blood cells 20,350/µL (segment 71%, lymphocyte 19.4%), AST 82 U/L, ALT 78 U/L, and CRP 3.16 mg/dL were elevated. Scrub typhus infection was clinically suspicious by the eschar with infectious sign and doxycycline was immediately started. On



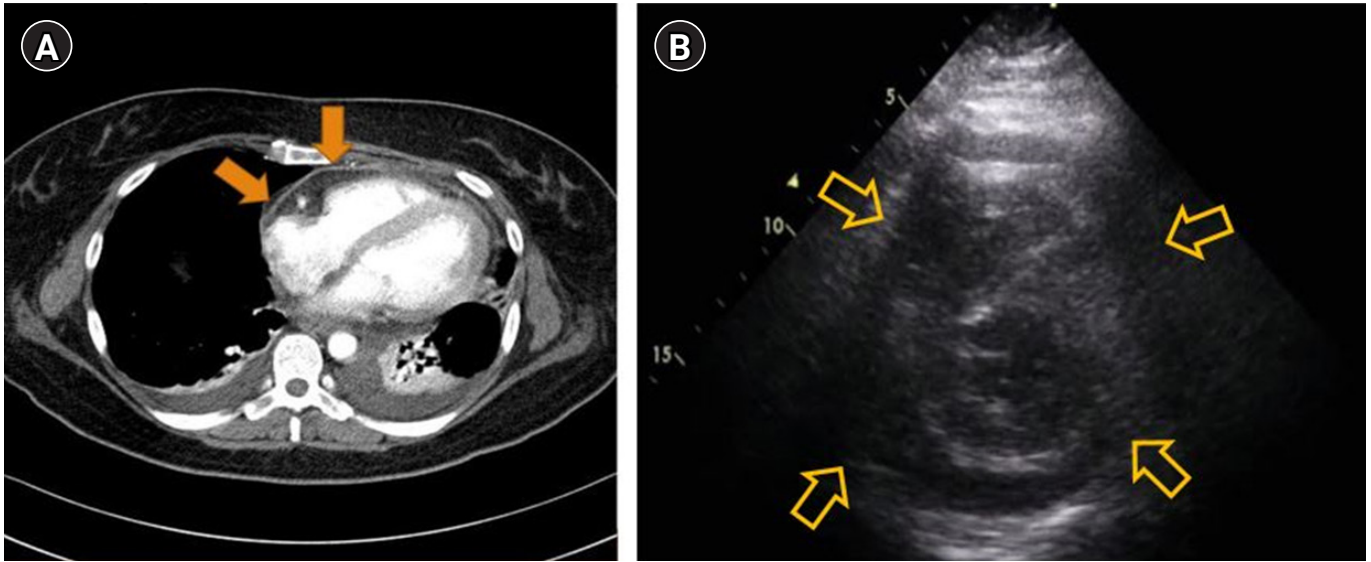
**Fig. 1.** The photo of public workplace in the infection. (A) The pallet manufacturing plant in a metropolitan area. Piles of logs in a neighboring carpentry workplace. (B) Pictures of the plant and surroundings show poor hygiene.

day 3 of the patient's hospital stay, the antibody titer to *O. tsutsugamushi* was elevated to 1:1,280 according to the indirect immunofluorescent antibody test, which confirmed the diagnosis of scrub typhus, but the resting dyspnea with generalized edema worsened slightly. A drowsy mentality with unstable vital sign was suddenly noted in the patient and urgent ECG revealed an overall low voltage QRS with

a nonspecific ST-T change (Fig. 2A). Emergent chest computed tomography and echocardiogram revealed a marked cardiac tamponade with a collapse of the right atrium and right ventricle (Fig. 3). Subsequently, an emergent pericardiocentesis was performed to alleviate the symptoms and hemodynamic status and pericardial fluid in amount of 485 mL was drained in the catheterization laboratory and



**Fig. 2.** The change of QRS voltage in the serial electrocardiogram (ECG) during the cardiac complication. (A) Initial ECG shows a low voltage of QRS amplitude in the intensive care unit. (B) Post-pericardiocentesis ECG shows improvement in the low voltage of QRS amplitude at discharge.



**Fig. 3.** The image of cardiac complications. (A) Chest computed tomography shows pericardial effusion with pericardial enhancement (filled arrows). (B) Echocardiography shows marked pericardial effusion (hollow arrows).

additional 618 mL of fluid was drained from the following day. The patient's overall clinical symptoms had suddenly improved (post-pericardiocentesis ECG) (Fig. 2B), and we finished doxycycline administration and removed the drain tube on hospital day 8.

## Discussion

The incidence of scrub typhus is positively correlated with the physical environment (temperature, precipitation, and climate change) and human activities in the rural area [9,10]. Sepsis was the most prevalent serious complication followed by pneumonitis, hepatitis, and acute respiratory distress syndrome in the scrub typhus infection [4]. However, fatal acute myocarditis, arrhythmia and coronary artery disease complicated by scrub typhus and environmental hazard in the metropolitan have been recently reported in Korea [5,6,11]. The most common cause of occupation-related infection was scrub typhus, followed by tuberculosis, viral hepatitis, and viral influenza and unskilled laborers were the most vulnerable to scrub typhus, followed by health care professionals [12]. In addition, cardiac complications including myocarditis, myocardial infarction, and pericarditis have been recently reported in South Korea [6,11]. The incidence rate of cardiac complication might have been underestimated because a scrub typhus infec-

tion, which generally presents with mild chest pain, dyspnea, and edema, might remain nonspecific and under-detectable. But, early detection of cardiac complications prior to hemodynamic instability is crucial because the clinical outcome depends on adequate hemodynamic support and proper intervention. Especially, ECG screening can be useful in the timely diagnosis of cardiac complications in the infection status [11].

Considering that scrub typhus infection could steadily increase in the public park and workplace-related environments in the metropolitan [9,10], hygiene protection in the workplace should be re-emphasized to reduce environmental hazards from scrub typhus in endemic geographies. In particular, these cases also serve as a warning for the risk of fatal complication and timely surveillance in severe scrub typhus infection.

## Article information

### Conflicts of interest

No potential conflict of interest relevant to this article was reported.

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## Author contributions

Conceptualization: KWK. Data curation: KWK. Formal analysis: KWK. Methodology: KWK. Project administration: KWK. Visualization: KWK. Writing - original draft: WK, KWK. Writing- review and editing: KWK.

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