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The First Fatal Case of *Chromobacterium violaceum* Infection in Japan

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Corresponding Author: Shinsuke Takeda, e-mail: s7.takeda.jpn@gmail.com**Financial support:** None declared**Conflict of interest:** None declared**Patient:** **Male, 49-year-old**
Final Diagnosis: ***Chromobacterium violaceum* infection**
Symptoms: **No symptom**
Medication: **—**
Clinical Procedure: **—**
Specialty: **Infectious Diseases****Objective:** **Rare disease****Background:** *Chromobacterium violaceum* (*C. violaceum*) is a gram-negative and facultative anaerobic oxidase-positive bacillus generally seen in tropical or subtropical areas (latitudes between 35°N and 35°S). *C. violaceum* infection is a rare but serious infection with high morbidity and mortality rates. Most clinicians practicing in non-tropical counties, such as Japan, are unfamiliar with it.**Case Report:** We report the first fatal case of a 49-year-old man infected with *C. violaceum* after a traffic accident in Japan (latitude 34.8°N). The patient reported brief submergence in a marshy muddy rice field after the accident. There was some evidence of soil and water contamination of the patient's skin and clothing, but he denied swallowing water or soil. There were no findings of pneumonitis or severe open wounds on admission. Until the night of the 7th day of hospitalization, his general conditions remained stable despite a persistent fever. However, he suddenly collapsed on the 8th day of hospitalization and died. *C. violaceum* bacteremia led to fatal sepsis on dissemination to the iliopsoas abscess, which is a rare combination for this infection.**Conclusions:** Episodes of exposure to contaminated water or soil, especially in summer, are important predisposing factors for *C. violaceum* infection. Thus, it is vital to include *C. violaceum* infections as a differential diagnosis, since the mortality rate of *C. violaceum* infections is high and the cases of this infection have increased in non-tropical counties.**Keywords:** ***Chromobacterium violaceum* • Fatal Outcome • Psoas Abscess**Full-text PDF: <https://www.amjcaserep.com/abstract/index/idArt/932037>

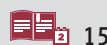
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Background

Chromobacterium violaceum (*C. violaceum*) is a gram-negative, facultative anaerobic oxidase-positive bacillus [1-3]. As *C. violaceum* is endemic in natural aquatic environments and is temperature sensitive, it has a predilection for tropical and subtropical areas (latitudes between 35°N and 35°S) [1,2]. *C. violaceum* infections in humans usually occur after exposure to contaminated soil or water, following traumatic soft tissue injuries, or water aspiration after near-drowning episodes [1-4]. Infections generally occur in summer, in mostly young and healthy patients [1,4,5]. Most clinicians practicing in non-tropical countries such as Japan are likely to be unfamiliar with this rare infection [1]. Here, we describe the first fatal case of *C. violaceum* infection that occurred after a traffic accident.

Case Report

A 49-year-old man with a no significant past medical history had a vehicle accident (motorcycle-to-car collision) and fell into the rice paddies in Toyohashi City, Aichi Prefecture, Japan (latitude 34.8°N), in August 2019. He was transferred to our Emergency Department with a high-energy trauma injury. The patient reported brief submergence in a marshy muddy rice field after the accident and denied swallowing water or soil. He also claimed to be conscious throughout the episode.

On admission, he reported feeling severe pain in his back, lumbar region, bilateral femur, and right thumb. There were no respiratory symptoms such as dyspnea. He denied any recent travel history, recent alcohol intake, illicit drugs, or regular medication intake. His vital signs on admission were as follows: Glasgow Coma Scale, E4V5M6; temperature, 36.3°C; heart rate, 90 bpm; blood pressure, 141/63 mmHg; respiratory rate, 18 breaths/min; and 100% oxygen saturation, on a 100% non-rebreather reservoir mask at 10 L/min of oxygen. On physical examination, there was some evidence of soil and water contamination of the patient's skin and clothing. His speech and food intake were unaffected. Respiratory sounds were clear to auscultation bilaterally and there were no severe open wounds. Only slight abrasion on bilateral knees was observed.

Radiography showed fractures of the right trochanteric femur, left distal femur, bilateral scapula, right thumb, and right lumbar (L1-L4) transverse process, and sixth thoracic vertebral compression fracture. Computed tomography (CT) showed right pulmonary contusion, right rib fractures (ribs 10-12), and slight hemorrhage of the right psoas major muscle because of a right lumbar (L1-L4) transverse process fracture. There were no findings of pneumonitis (Figure 1). None of the fractures were open fractures. Blood test results revealed significantly elevated white blood cell (WBC) count of $15.3 \times 10^3/\mu\text{L}$ with

67.3% of neutrophils; hemoglobin (Hb), 12.7 g/dL; platelet (Plt), $18.8 \times 10^4/\mu\text{L}$; C-reactive protein (CRP), 0.01 mg/dL; total protein (TP), 6.3 g/dL; albumin (Alb) 3.9 g/dL; aspartate aminotransferase (AST), 213 U/L; alanine aminotransferase (ALT), 151 U/L; total bilirubin (T.bil) 0.6 mg/dL; creatine kinase (CK), 490 U/L; blood urea nitrogen (BUN), 15 mg/dL; creatinine (Cre), 0.63 mg/dL; prothrombin time–International normalized ratio (PT-INR), 0.97; fibrinogen (Fib), 233 mg/dL. Electrocardiograms did not reveal any remarkable findings.

On admission, we administered nonsteroidal anti-inflammatory drugs (NSAIDs) for his pain. Both femoral fractures required standby operations. On the 4th day of hospitalization, we performed surgery to repair his right trochanteric femoral fractures through open reduction and internal fixation under lumbar spinal anesthesia. On the 5th day of hospitalization, his fever increased to almost 40°C (Figure 2), which was higher than the expected postoperative day 1 temperature. We also examined 2 sets of blood cultures. We treated the patient with a perioperative antibiotic, cefotiam, to prevent surgical site infection on the 4th and 5th days of hospitalization. Blood test results on the 5th day revealed a WBC count of $7.46 \times 10^3/\mu\text{L}$ with 74.1% neutrophils; Hb, 7.6 g/dL; Plt, $15.0 \times 10^4/\text{L}$; CRP, 19.95 mg/dL; AST, 61 U/L; ALT, 60 U/L; CK, 1352 U/L; PT-INR, 1.06; Fib, 736 mg/dL. The patient also received a red blood cell transfusion (280 mL) on the 5th day of hospitalization. His fever was below 38°C on the 6th and 7th days of hospitalization (Figure 2).

Until the night of the 7th day of hospitalization, his back and bilateral femur pain persisted. However, his general conditions, including speech and food intake, remained stable, and he experienced no respiratory distress. There were no signs of surgical site infection or infected wounds. The patient experienced insomnia on the night of the 7th day because of postoperative left femur pain. In the early morning of the 8th day of hospitalization, chest pain gradually appeared in along with dyspnea and cyanosis. Acute coronary syndrome, acute aortic dissection, cardiac tamponade, and pulmonary embolism were suspected and we performed blood tests, 12-lead electrocardiography (ECG), and echocardiography and then prepared for contrast-enhanced CT. The ECG newly identified a left bundle branch block, suggesting a new onset of coronary artery disease. Echocardiography showed no pericardial effusion, no right ventricular (RV) enlargement, no RV free wall hypokinesis, and mild tricuspid valve regurgitation. These findings suggested that this patient had no cardiac tamponade and was less likely to have pulmonary embolism.

Before the patient underwent CT, he went into shock and cardiopulmonary arrest shortly thereafter. Advanced cardiac life support was initiated according to the American Heart Association guidelines [6]. Percutaneous cardiopulmonary support (PCPS) was introduced immediately for cardiopulmonary resuscitation

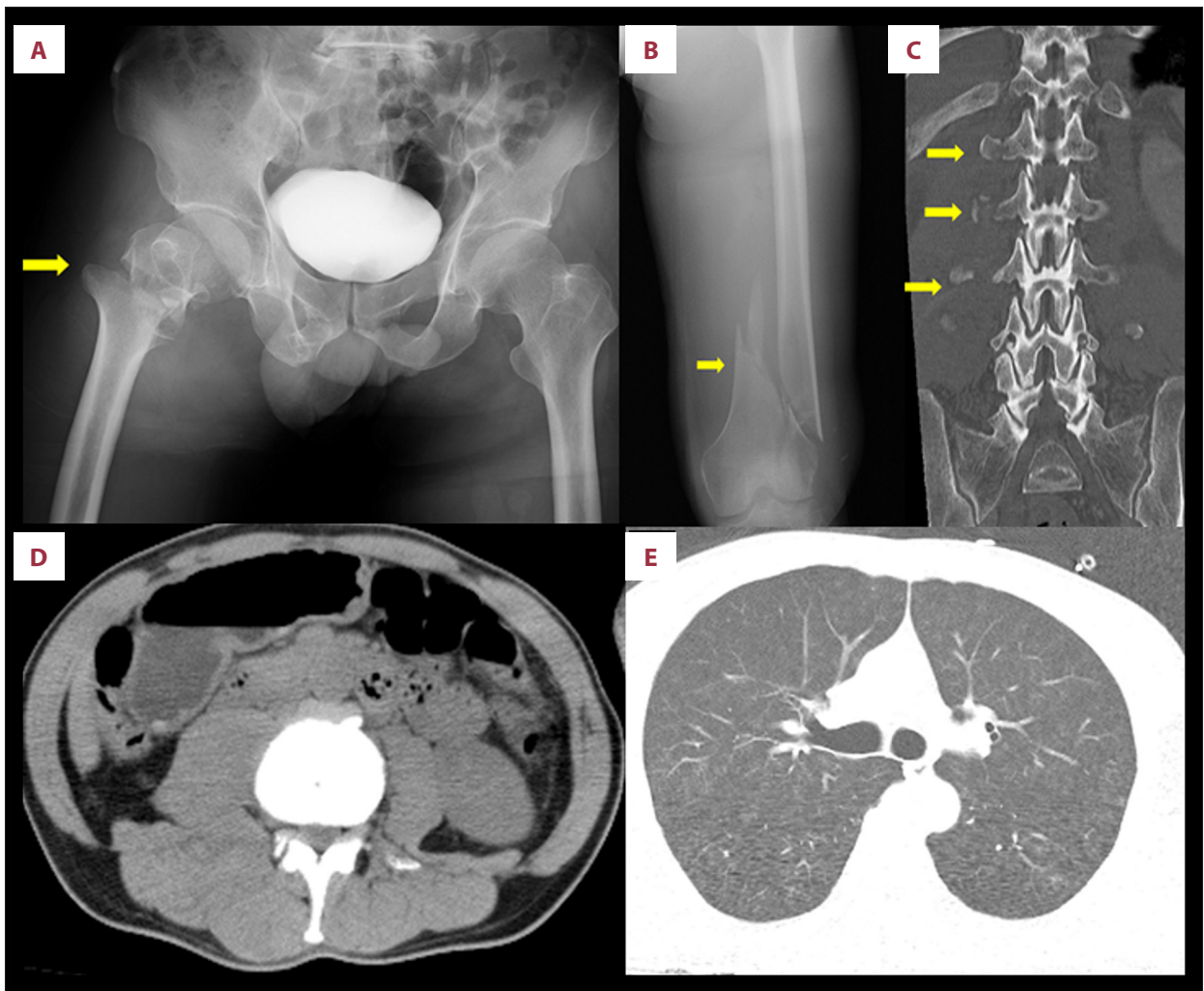


Figure 1. Radiographical findings of the major fractures and the lungs. Radiographs showing right trochanteric femoral fracture (A) and left distal femoral fracture (B). Computed tomography (CT) scans showing right lumbar transverse process fractures (C), and slight hemorrhage of right psoas major muscle by the right lumbar transverse process fracture, (D), and no findings of pneumonitis (E).

and the patient also underwent emergency angiography. We did not detect any pulmonary emboli. We could not perform coronary angiography because of unstable hemodynamics after immediate introduction of PCPS. We could not resuscitate the patient and pronounced him dead. Blood test results after cardiopulmonary arrest revealed WBC count, $1.75 \times 10^3/\mu\text{L}$ with 78.8% neutrophils; Hb, 8.4 g/dL; Plt, $19.5 \times 10^4/\mu\text{L}$; CRP, 54.10 mg/dL; TP, 4.2 g/dL; Alb 1.7 g/dL; AST, 346 U/L; ALT, 192 U/L; T.bil, 4.8 mg/dL; CK, 7289 U/L; creatine kinase-MB isoenzymes (CK-MB), 66 U/L; BUN, 39 mg/dL; Cre, 2.80 mg/dL; PT-INR, 1.55; Fib, 832 mg/dL; D-dimer, 18.5 $\mu\text{g/mL}$. After his death on the 8th day of hospitalization, results from 2 sets of blood cultures performed on the 5th day revealed the growth of *C. violaceum*. Further analyses for antibiotic sensitivity revealed that this strain of *C. violaceum* was resistant to cephalosporins, aztreonam, sulbactam/ampicillin, and piperacillin/

tazobactam, but was sensitive to ciprofloxacin, levofloxacin, cefepime, and meropenem. Postmortem CT showed a bilateral pulmonary congestion and pleural effusion in addition to a low-density mass in the right psoas major muscle (Figure 3). Histopathological findings of the right psoas mass at autopsy revealed that the cause of the patient's death was sepsis caused by *C. violaceum* (Figure 4).

Discussion

Since the first reported case of human infection of *C. violaceum* from Malaysia in 1927, approximately over 200 cases of human *C. violaceum* infection have been reported worldwide [1,7]. Currently, only 6 cases from 5 case reports have been presented from Japan, and here we report the first case

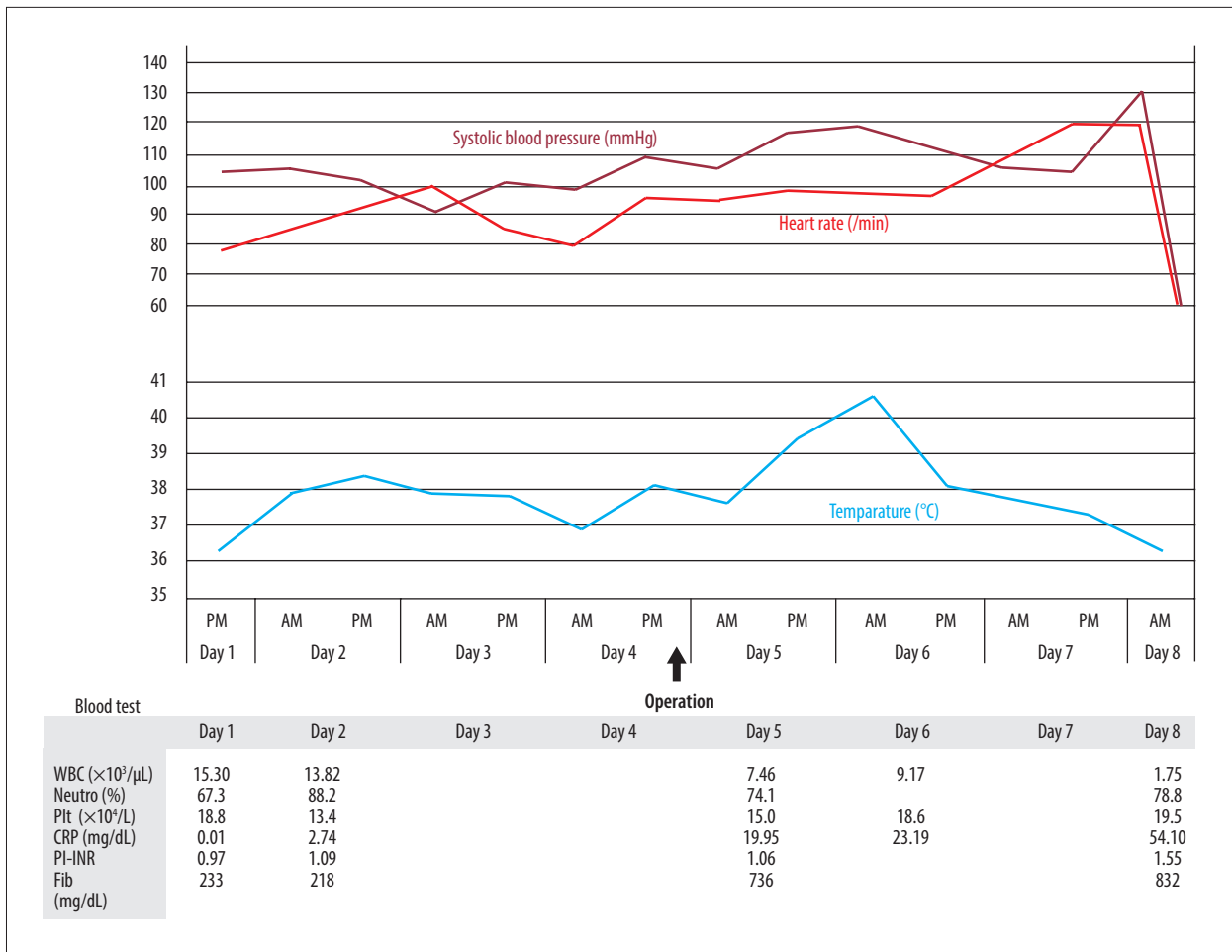


Figure 2. Temporal changes in major vital signs during the hospitalization and laboratory results. Plots showing changes in systolic blood pressure, heart rate, and temperature of the patient twice a day (AM and PM) on each day after hospital admission. WBC – white blood cell; Neutro – neutrophils; Plt – platelet; CRP – C-reactive protein; PT-INR – prothrombin time-international normalized ratio; Fib – fibrinogen.

of death caused by *C. violaceum* infection in Japan [2-3,8-10]. In East Asian countries with similar climate conditions, some fatal cases have been reported [11,12].

Since there are few reports of *C. violaceum* infection in Japan, most clinicians are unfamiliar with this infection, although the mortality rate of *C. violaceum* infection exceeds 50% and *C. violaceum* is endemic to approximately half of the geographical area of Japan (confined between latitudes of 35°N and 35°S) [1]. Since there are only a few cases reported from Japan and nearly half of the country is endemic to *C. violaceum*, providers must maintain an index of suspicion of this pathogen in clinically relevant cases.

In the present case, *C. violaceum* infection progressed rapidly, and the patient died on the 8th day of hospitalization, which was consistent with a previous study stating that the median survival duration of this infection was 7 days [1]. *C. violaceum*

bacteremia progresses rapidly to fatal sepsis on dissemination to multiple organs, predominantly in the lungs, liver, and spleen, within a short time [10,13,14]. Nearly half of the patients had localized abscesses in visceral organs [1]. Cases presenting with both localized and iliopsoas abscesses are rare; only 1 of 106 patients presented with both localized and iliopsoas abscesses [1].

Trauma followed by exposure to contaminated water or soil is an important predisposing factor associated with this disease, even without swallowing the water and/or soil [1]. Trauma-induced soft tissue infections, such as phlegmon, necrotizing fasciitis, and subcutaneous abscess, may also underlie *C. violaceum* infection [10]. The present case study underscores the importance of history-taking about exposure to contaminated water or soil even though patients denied a loss of consciousness or drawing and/or swallowing contaminated water or soil during episodes. Once exposure is confirmed, it is

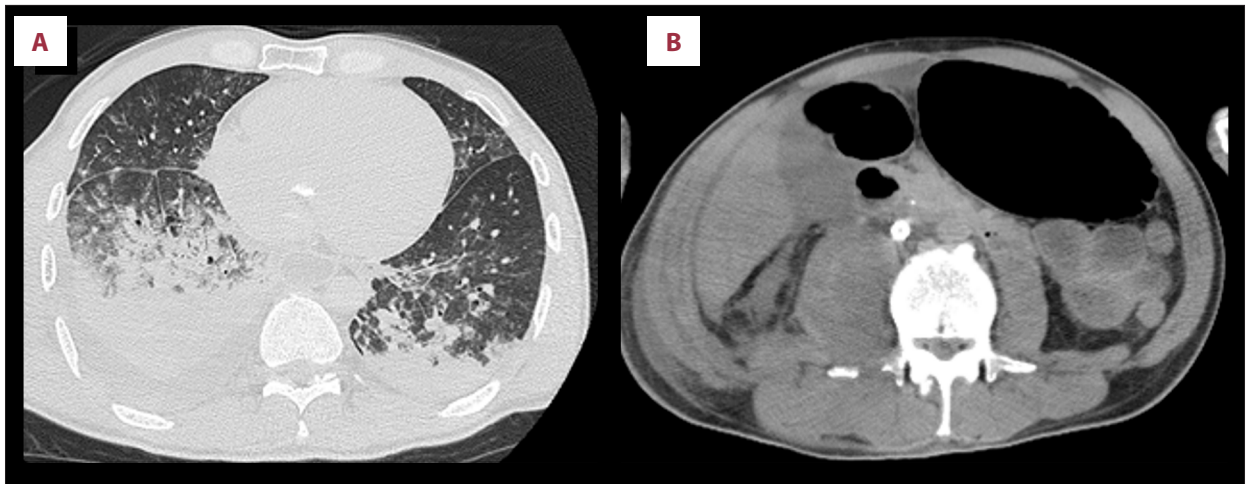


Figure 3. Postmortem computed tomography findings of the chest and abdomen. (A) Bilateral dorsal pulmonary congestion. (B) Heterogeneous low-density mass in the right psoas muscle.

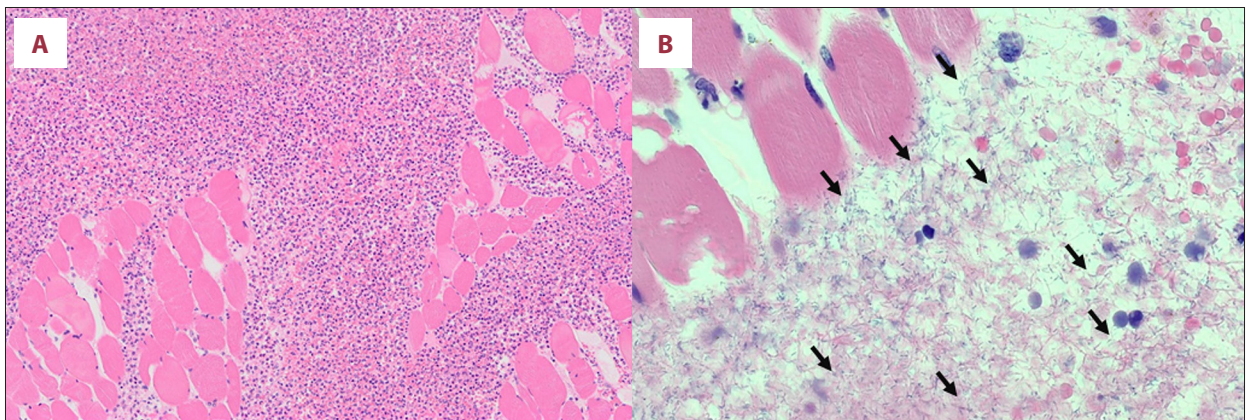


Figure 4. Microscopic findings of the psoas abscess at autopsy. (A) Light micrograph with hematoxylin and eosin staining showing psoas abscess and inflammatory cell infiltration by neutrophils and mononuclear cells. (B) At a higher magnification, numerous bacilli (arrows) are scattered.

necessary to include *C. violaceum* infection as a differential diagnosis of fever after trauma.

It was difficult to detect the infection owing to the lack of knowledge of *C. violaceum*. Multiple fractures were more likely causative of the patient's constant backache and lumbago. Hence, we did not suspect an abscess in the psoas major muscle. Moreover, treatment with NSAIDs for pain and postoperative fever masked his actual body temperature. Therefore, fever over 40°C after the surgery was the only clue of a serious infection. However, respiratory rate is an important indicator for sepsis, and we might have detected the patient's abnormality earlier [15]. It is conceivable that recording of respiratory rate as a one of the vital signs is essential in daily clinical practice.

As *C. violaceum* sepsis rarely occurs, little is known about its optimal antibiotic therapy. Most strains appear to be resistant to penicillin and cephalosporins [2-3,5]. In vitro studies

showed that ciprofloxacin was the most effective antibiotic against *C. violaceum* [2-3,5]. As cefotiam was used for perioperative antibiotic treatment to prevent surgical site infection, it had no protective effect against *C. violaceum* infections. With global warming, *C. violaceum* infection has increased in non-tropical climate regions, and several recent infections have occurred in geographical areas beyond those endemic to *C. violaceum* [1-3]. It is important to further study the multidrug resistance of *C. violaceum* and to choose broad-spectrum antibiotics such as ciprofloxacin.

Conclusions

In conclusion, we experienced the first fatal case of *C. violaceum* infection, in a 49-year-old man with no remarkable past medical history who died after a traffic accident. Exposure to contaminated water or soil, especially in summer, was considered

as an important predisposing factor associated with *C. violaceum* infections. As most strains are resistant to penicillin and cephalosporins (including cefotiam of our case), ciprofloxacin may be the most effective antibiotic against *C. violaceum*. Because of the high mortality rate associated with this infection, it is vital to include *C. violaceum* infections as a differential diagnosis, since *C. violaceum* infections have increased in non-tropical counties.

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