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A patient with resistant *Chromobacter iumviolaceum* infection

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Abstract: A 73-year-old female was hit in the face by a mirror from a passing car and she fell into a rice paddy field. Because she was unconscious, she was transferred to our department. After securing the airway, a traumatic pan-scan revealed a subarachnoid hemorrhage, fractures on the left side of the patient's face, a left radical fracture and aspiration. Her face was initially deterged with massive fluid. Within a few hours from arrival, her oxygenation deteriorated rapidly. She underwent empiric therapy. The blood and sputum cultures were found to be positive for C. violaceum. The β-D glucan level became positive, thus antifungal therapy was added. After achieving an improvement inthe patient's bloody inflammatory reaction and respiratory function, she began to complain of headache. An enhanced MRI of the patient's head demonstrated multiple ring-enhanced areas in the brain, suggestive of a cerebral access. A spinal tap demonstrated increase of white blood cells. Meropenem, vancomycin, and fluconazole infusion therapy was administered for three months. After becoming a febrile and obtaining a negative bloody inflammatory reaction, the infusion of these antibiotics was terminated. However, the patient again developed a high fever and multiple patchy lesions in the lung and brain still remained. Her infection could not be completely controlled and she was transported to another medical facility for rehabilitation. The infusion of the maximum dose of antibiotics that can be tolerated based on the pharmacokinetics/pharmacodynamics theory must be administered when a patient is exposed to contaminated soil or water.

Keywords: *Chromobacterium violaceum*; brain; lung; abscess; antibiotics; outcome.

INTRODUCTION

Bacteria producing violet colonies due to the production of a non diffusible pigment violacein were classified as a redefined genus *Chromobacterium* [1]. The genus *Chromobacterium* consists of 7 recognized species: *C. violaceum*, *C. subtsugae*, *C. aquaticum*, *C. haemolyticum*, *C. pseudoviolaceum*, *C. piscinae*, and *C. vaccinia* [2]. *C. violaceum* is a Gram-negative saprophyte from soil and water in tropical and sub-tropical regions that is considered to be an opportunistic pathogen of extreme virulence in humans [1]. Since the first case from Malaysia in 1927, approximately 150 cases have been reported worldwide, mainly from tropical regions [3]. We herein report the fourth known Japanese case with a resistant *C. violaceum* infection [4-6].

CASE REPORT

A 73-year-old female was hit in the face by a mirror from a passing car and she fell into a rice paddy field. Because she was unconscious, she was transferred to our department. She had no notable past or family medical history. Upon arrival, her Glasgow Coma Scale was a sum score of 13, and she had a blood pressure of 70/54 mmHg, heart rate of 63 beats per minute (BPM), and a SpO_2 of 92% under inhalation of 15 L/minutes of oxygen. Her left face had a developing injury that had become severely contaminated by the mud and her left forearm had a deformity with swelling. After securing the airway and infusional route, a traumatic pan-scan revealed a subarachnoid hemorrhage, fractures on the left side of the patient's face (Figure 1), a left radical fracture and aspiration. The findings of an arterial blood gas analysis (FiO_2 1.0) were pH: 7.370, PCO_2: 47.1 mmHg, PO_2: 69.7 mmHg, HCO_3^-: 26.6 mmol/l, and base excess:1.4 mmol/l. The results of biochemical analyses of the blood performed on arrival were as follows: white blood cells, 7200/μl; hemoglobin, 11.9 g/dl; platelets, 16.4×10^4/μl; total protein, 5.8 g/dl; glucose, 130 mg/dl; aspartate aminotransferase, 41 IU/L; alanine aminotransferase, 25 IU/L; blood urea nitrogen, 14.7 mg/dl; creatinine, 0.57 mg/dl; sodium, 141 mEq/L; potassium, 3.5 mEq/L; chloride, 105 mEq/L; creatine phosphokinase, 261 IU/L; prothrombin time 11.6 sec; and activated partial thromboplastin time, 29.4 sec. Her face was initially deterged with massive fluid and the wounds were closed while the patient was under general anesthesia. Within a few hours from arrival, her oxygenation deteriorated rapidly and thereafter both lung fields on the chest roentgen examination also deteriorated (Fig-2). She underwent empiric therapy using meropenem

with mechanical ventilation in the intensive care unit. Because her respiratory function did not improve, tracheostomy was performed on the 5th hospital day. The blood and sputum cultures were found to be positive for *C. violaceum.* This particular *C. violaceum*isolate was resistant to benzylpenicillin and ampicillin, but sensitive to cefotaxime, imipenem/cilastatin, levofloxacin, ceftriaxone, and minocycline; thus, the meropenem therapy was discontinued and cefotaxime treatment was initiated. A chest CT scanon the 13th hospital day revealed multiple patchy lesions in the lung fields, and the formation of abscess was suspected(Fig-3). The β-D glucan level became positive, thus micafungin infusion therapy was added. After achieving an improvement in the patient's bloody inflammatory reaction and respiratory function, the sedative was ceased. However, the patient's status nevertheless deteriorated. After the return of consciousness, she began to complain of headache. An enhanced MRI of the patient's head demonstrated multiple ring-enhanced areas in the brain, suggestive of a cerebral access (Figure 4). A spinal tap demonstrated white blood cells,1936/ μl; protein, 115 mg/dl; glucose, 43mg/dl, positivity for β-D glucan. She was diagnosed with multiple pulmonary and cerebral accesses induced by *C. violaceum* and fungal infections. Instead of cefotaxime and micafungin therapy, meropenem, vancomycin, and fluconazole infusion therapy was administered for three months. During these treatments, the patient's hydrocephalus status worsened. After becoming a febrile and obtaining a negative bloody inflammatory reaction, the infusion of these antibiotics was terminated. However, the patient again developed a high fever, and multiple patchy lesions in the lung and brain still remained (Fig-3, 4); thus, she was prescribed oral minocycline and fluconazole therapy. Because her infection could not be completely controlled, the ventriculoperitoneal shunt operation was postponed. She was transported to another medical facility for rehabilitation due to disuse atrophy and consciousness disturbance on the 156th hospital day.

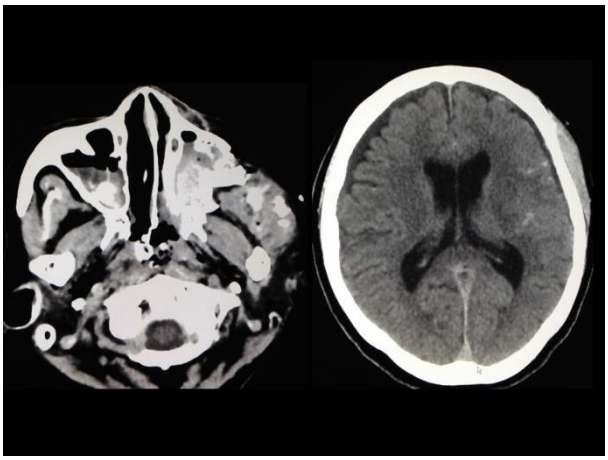

Fig-1: Craniofacial CT on arrival. The CT scan revealed a left open facial fracture and a subarachnoid hemorrhage.

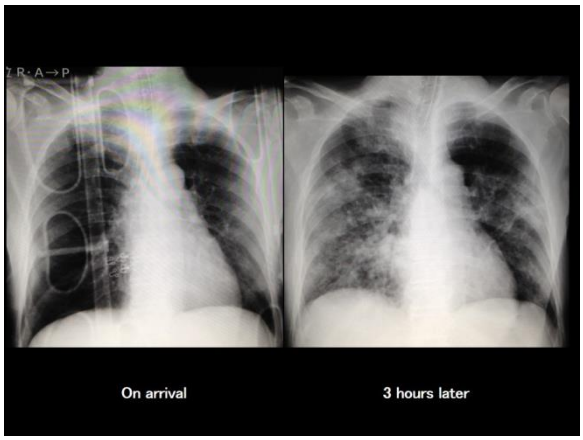

Fig-2: Chest X-ray on arrival and after three hours. Rapid deterioration on the chest X-ray was observed.

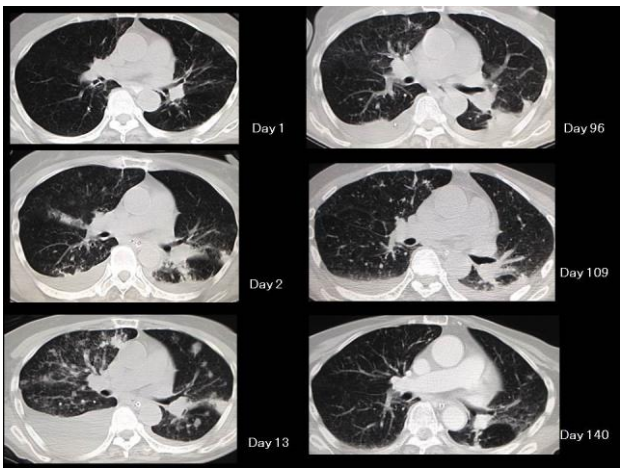

Fig-3: Time course of the patient as visualized by chest CT. Multiple patchy lesions developed by the 13th hospital day. Themultiple patchy lesions in the lung become small, however still remains on the 140th hospital day.

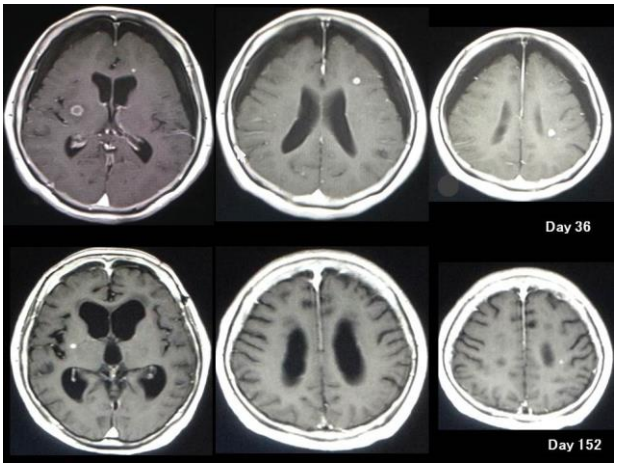

Fig-4: Time course of the patient as visualized byhead MRI. Head MRI demonstrated multiple ring-enhancing lesions on the 36th hospital day. The multiple lesions become small but still remain on the 152nd hospital day.

DISCUSSION

C. violaceum rarely infects humans, however, soft tissue infection induced by trauma, such as phlegmon, necrotizing fasciitis, subcutaneous abscess or lymph node infection, may occur. This bacterium should be considered in the differential diagnosis of skin lesions that quickly worsen after trauma associated with exposure to river or lake water [7]. Alternatively, systemic infection may also follow the aspiration or ingestion of contaminated water [8]. Unknown sources of infection have also been reported [9]. In the present case, aspiration of dirty water was the major source of infection, rather than a contaminated opened facial fracture, because the facial wounds were controlled by the initial irrigation and infusion of antibiotics. Once infection is established, a *C. violaceum* infection may rapidly progress to sepsis with multiple organ abscesses, predominantly in the lungs, liver, and spleen [7]. In the present case, pulmonary and cerebral abscess formation occurred. Patients with underlying defects in their host defenses, particularly patients with chronic granulomatous diseaseorglucose 6-phosphate dehydrogenase deficiency, may be predisposed to *C. violaceum* infection [7]. However, most patients reported to have *C. violaceum* infections were healthy individuals, similar to the present case.

*C. violaceum*is generally considered being resistant to ampicillin, cephalosporins and aztreonam and susceptible to chloramphenicol, tetracycline, and ciprofloxacin and trimethoprim/sulfamethoxazole; the latter two antibiotics have been recommended for the treatment of patients infected by *C. violaceum*. Once *C. violaceum* infection is established, prolonged antimicrobial treatment for at least six weeks is recommended, as relapse of the disease has been documented and postulated to be due to the presence of internal organ abscesses [10]. In the present case, even infusion with antibiotics that the *C. violaceum* should have been sensitive to failed to control the infection.

CONCLUSION

The infusion of the maximum dose of antibiotics that can be tolerated based on the pharmacokinetics /pharmaco dynamics theory must be administered when a patient is exposed to contaminated soil or water.

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