

Chromobacterium violaceum infection in Taiwan: a case report and literature review

Choon-Yuk Chang¹, Yuan-Ti Lee¹, Ken-Sen Liu¹, Ya-Li Wang², Shih-Ming Tsao¹

¹Division of Infections, Department of Internal Medicine and ²Department of Clinical Laboratory, Chung Shan Medical University Hospital, Taichung, Taiwan

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Chromobacterium violaceum is a facultative anaerobic, Gram-negative bacillus which inhabits stagnant water in tropical and subtropical regions. We describe the case of an 80-year-old female patient with *C. violaceum* bacteremia due to traumatic wound infected by contaminated water and soil. She had persistent fever, hypotension and neutrophilic leukocytosis on admission. Two sets of blood cultures yielded *C. violaceum*. The patient was successfully treated with levofloxacin. Since the first case from Malaysia in 1927, about 150 cases have been reported in the world literature. To our knowledge, six other cases have been reported previously from Taiwan, including two children and four adults. Of the total of seven patients from Taiwan, four had a fatal outcome within several days, while the three survivors were apparently free of vital organ involvement. Although human infections caused by *C. violaceum* are rare, clinicians should be aware of this potentially fatal infection as part of the differential diagnosis of sepsis associated with a history of exposure to stagnant water.

Key words: Bacteremia; Cellulitis; *Chromobacterium*; Taiwan

Introduction

Chromobacterium violaceum is a common inhabitant of soil and water — particularly stagnant or slow-moving water sources in tropical and subtropical regions [1,2]. Although human infections are rare, they carry a high mortality rate [2]. *C. violaceum* was first identified in 1881 and its pathogenic potential was first described by Woolley in 1905, who isolated it from a fatal infection in buffalo in the Philippines [3]. The first case of *C. violaceum* was found in humans in 1927 in Malaysia [4]. Since then, about 150 cases have been reported worldwide from mainly tropical and subtropical regions, including Brazil, Southeast Asia, and the southeastern United States, where the majority of the cases occur in Florida [1,2]. In most of the cases, infections occurred after exposure of broken skin to contaminated water or soil. Visceral abscesses developed rapidly in liver, lung and spleen.

Severe sepsis and ineffective antibiotic therapy led to fatality rates as high as 65% of reported cases [5].

To our knowledge, six cases of *C. violaceum* infection have been reported previously from Taiwan, which is located in a subtropical area [6-9]. We present an 80-year-old female patient with *C. violaceum* bacteremia due to a traumatic wound infected by contaminated water and soil in central Taiwan, together with a literature review.

Case Report

An 80-year-old Hakka farmer woman was admitted to Chung Shan Medical University Hospital on 13 September 2005 due to fever and right knee abrasion wound. She lived in Guoshing village, Nantou County and had been in good health until two weeks ago when she slipped and fell on farmland. Thereafter, her right lower leg become swollen with edematous change. Moreover, an erythematous ulceration developed. Fever and chills were noted for three days before she was admitted to another hospital. Because of persistent fever, she asked to transfer to our hospital two days later. She denied any other systemic disease except hypertensive

Corresponding author: Dr. Shih-Ming Tsao, MD, Division of Infections, Department of Internal Medicine, Chung Shan Medical University, No. 110, Sec. 1, Chien-Kuo N. Rd., Taichung City, Taiwan.
E-mail: tsmhwy@ms24.hinet.net

cardiovascular disease which had been treated for more than 10 years. She also denied history of recent travel, contact with pets or ingestion of raw food.

On admission, she looked acutely ill with a temperature of 38.5°C and tachycardia with a pulse rate of 121 beats/min. Blood pressure was 95/60 mm Hg. Physical examination was unremarkable except for a pustular skin defect of the right knee 3 × 1.2 × 0.2 cm in size. There was no lymphadenopathy or skin rash. Laboratory findings showed total white cell count of 16,860/mL, with 84.7% segments, hemoglobin 13.9 g/dL, platelet count 117 × 10³/mL, and C-reactive protein 18.5 mg/dL (normal, <0.4 mg/dL). Non-fasting blood glucose was 205 mg/dL with glycosylated hemoglobin 5.8% (upper limit of normal). Otherwise, biochemical data were within normal limits. No evidence of abnormality was found in chest X-ray on ultrasonography of abdomen.

During hospitalization, the patient was suspected to have Gram-negative septicemia and was started on cefotaxime empirically for three days. On the fourth hospital day, two sets of blood cultures obtained on the day of admission yielded *C. violaceum*. When the culture and sensitivity reports were available, antibiotics were changed to levofloxacin (500 mg intravenous once daily for seven days followed by oral forms in the same dose). After a total of nine days' therapy, the patient recovered and was discharged.

C. violaceum was isolated from blood culture (BACTEC 9240 system; Beckson Diagnostic Instrument System, Sparks, MD, USA) which was inoculated on sheep blood agar, eosin methylene blue agar and chocolate agar plates. After aerobic incubation for 24 h at 37°C on blood agar, 0.5-1.5 mm colonies developed with a narrow zone of beta-hemolysis. After 48-h incubation, violet pigmented colonies were visible (Fig. 1). The conventional biochemical tests and characteristics of the isolated *C. violaceum* are shown in Table 1. Results using the API-20E kit (bioMérieux, Hazelwood, MO, USA) were positive for *C. violaceum* (76.8%), *Pseudomonas aeruginosa* (20.3%) and *Pseudomonas fluorescens/Pseudomonas putida* (2.6%). The API-20NE kit (90.6%), Phoenix 100 System (Beckson Diagnostic Instrument System) and VITEK 2 System (bioMérieux) were used for further identification. All results of biochemical tests were consistent with the identification of *C. violaceum* (Table 1). Antibiotic susceptibility testing of the organism by disk-diffusion method according to the guidelines of the National Committee for Clinical Laboratory

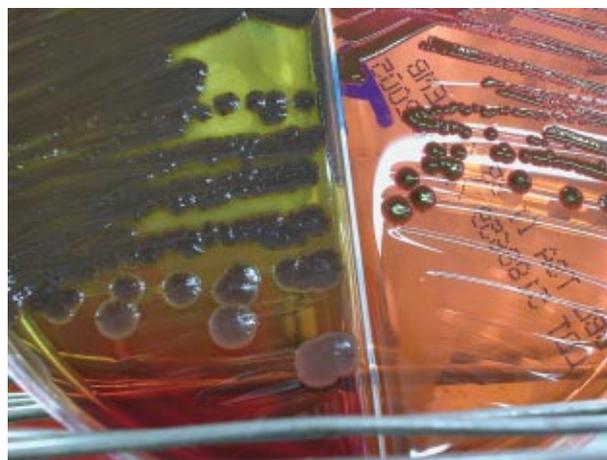


Fig. 1. The violet pigmented colonies on blood agar.

Standards [10] showed the isolate to be resistant to amoxicillin-clavulanic acid, amikacin, cephalothin and cefuroxime, but sensitive to piperacillin-tazobactam, gentamicin, levofloxacin, ceftazidime, ceftriaxone, cefepime, ertapenem and meropenem.

Discussion

Although *C. violaceum* infection is confined to tropical and subtropical areas, it is rarely found in Taiwan. The first case from Taiwan was reported in 1968, when *C. violaceum* was isolated from blood and pus of a 22-month-old child in whom broken skin had been contaminated with soil and water [6]. Since then, only six cases of *C. violaceum* infection from Taiwan have

Table 1. Conventional biochemical test results and characteristics of the isolated *Chromobacterium violaceum*

Test	Result
Oxidase	+
TSIA slant	K
TSIA butt	A
Gas from TSIA	-
Hydrogen sulfide from TSIA	-
Urease	-
Motility	+
Indole production	-
Voges-Proskauer	-
Citrate utilization	+
Lysine decarboxylase	-
Arginine dihydrolase	+
Ornithine decarboxylase	-
Pigment	Violet
Haemolysis on BAP	Beta-hemolysis

Abbreviations: TSIA = triple sugar iron agar; BAP = blood agar plate; + = positive; K = alkaline; A = acid; - = negative

Table 2. Clinical features of published cases of *Chromobacterium violaceum* infection from Taiwan

Year	Age of patient (years)	Clinical presentation	Treatment	Month	Outcome	Reference
1968	2	Cellulitis and sepsis ^a	Chlorophenical and gentamicin	October	Died	Wu et al [6]
1984	18	Necrotizing fasciitis and sepsis ^a	Ceftazidime	September	Recovered	Chen et al [9]
1998	44	Cellulitis and sepsis	Piperacillin	October	Died	Chou et al [7]
1998	73	Localized cellulitis	Piperacillin and ciprofloxacin	September	Recovered	Chou et al [7]
2002	4	Nasopharyngeal abscess	Oxacillin	March	Died	Shao et al [8]
2003	20	Intra-abdominal abscess	Flomoxef	August	Died	Chen et al [9]
2005	80	Localized cellulitis ^a	Cefotaxime and levofloxacin	September	Recovered	Present study

^aTraumatic history.

been reported in the literature. Of the six patients of previous reports and the present one, two were children and five were adults (Table 2). All cases were documented, with *C. violaceum* isolated from blood. None of them had a history of any immunocompromised condition, although patients with chronic granulomatous disease [11] and G6PD deficiency [12] are particularly vulnerable to *C. violaceum* infection. Only three cases had traumatic wound with exposure history of stagnant waters and one case had a history of laparoscopic cholecystectomy. Despite most cases of *C. violaceum* infection in the literature benign infected via skin lesion (as in the present case), infection via ingestion of contamination water has been described [13]. This mode of infection might be the reason why four of seven cases from Taiwan in our review had no history of trauma. In cases from Taiwan, the infection always began as localized cellulitis, followed by rapid development of fulminant bacteremia with multiple organ involvement; three patients were described as having pulmonary involvement with multiple organ abscesses. In addition, *C. violaceum* was isolated from conjunctival exudate in a 5-year-old boy who was known to be the first case of chromobacteriosis with nasopharyngeal abscess [8]. Those patients with multiple visceral involvement or nasopharyngeal abscess had fatal outcome within several days. Otherwise, three survivors apparently did not have progression to vital organs, even though *C. violaceum* could be isolated from blood. Six of seven cases of infection occurred during the months of July through October, consistent with previous description in the literature [1,2].

C. violaceum is a motile, facultative anaerobic, catalase-positive, Gram-negative bacillus. The organism grows well on blood and MacConkey's agars and produces a striking pigment, violacein, which gives the colonies their distinctive purple color. However, approximately 9% of *C. violaceum* are non-pigmented

strains which have been documented in human infection [5,14]. The non-pigmented strains are difficult to identify as they are confused with *Pseudomonas* spp. or *Vibrionaceae* because of similarity in their biochemical properties.

C. violaceum is usually resistant to penicillins and narrow-spectrum cephalosporins [1,2]. The susceptibilities to third-generation cephalosporins and aminoglycosides were variable. Whereas they were susceptible to chloramphenicol, trimethoprim-sulfamethoxazole, tetracyclines and ciprofloxacin and the isolates from most patients are expected to be susceptible to cefepime and imipenem. Although the recommended antimicrobial treatment for *C. violaceum* infection is not well established, broad-spectrum cephalosporins, carbapenems or fluoroquinolones may be an appropriate initial choice for patients exposed to contaminated stagnant water in Taiwan, considering the similarity in clinical manifestations of other Gram-negative infection such as those caused by *Aeromonas* spp., *Vibrio* spp. and *Burkholderia pseudomallei* in melioidosis [15-17]. Therefore, early and aggressive antimicrobial drug therapy is critical, in order to reduce the high mortality rate associated with these infections, especially in traumatic injury with wounds contaminated by soil or water [17].

Although human infections caused by *C. violaceum* are rare, the increasing incidence suggests that this is an emerging pathogen [18]. A high index of suspicion is required for this potentially fatal infection. Physicians in tropical and subtropical regions should consider *C. violaceum* infection as part of the differential diagnosis of sepsis associated with a history of exposure to stagnant water.

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