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Wound Infection Caused by *Chromobacterium violaceum*: A Case Report from a Tertiary Care Hospital in Bangladesh

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Abstract

Chromobacterium violaceum is a Gram negative, facultative anaerobe, generally present in water, soil in tropical and subtropical regions. This bacterium is an emerging environmental pathogen that causes life threatening infection in humans and animals. It can cause wound infection, visceral abscess, septicaemia, meningitis, diarrhoea, UTI. It is associated with significant mortality due to severe systemic infection. As the bacteria have high spreading tendency leading to sepsis, early identification and prompt treatment is necessary. Here we report a case of *Chromobacterium violaceum* wound infection in a 9 years old male from Dhaka, who was successfully treated with combination of cefixime and flucloxacillin antibiotics as per culture sensitivity report.

Keywords

Chromobacterium violaceum, Wound Infection, Antibiotics

1. Introduction

Chromobacterium violaceum is free living, soil and fresh water, Gram negative, facultative anaerobe, catalase, oxidase positive, motile bacillus, which grows readily in simple nutrient agar, MacConkeys agar, blood agar, CLED media. The first human case was reported from Malaysia in 1927. A total of 150 cases have been reported worldwide, mainly from tropics, including 8 cases from India [1]. In 1905, Wooley first reported its pathogenic characteristics when he observed septicaemia in water buffaloes [2]. Modes of transmission are by intake of con-

taminated water, exposure of wound and traumatic lesions to contaminated soil and water, insertion of urinary catheter or use of different medical equipment in hospital environment [3].

It has been reported in Bangladesh in 2017 and 2018 [3] [4]. Serious and fatal infections have been reported from Argentina, Australia, Brazil, Cuba, Nigeria, USA, Taiwan (China), Singapore, and Vietnam. In most cases route of entry through broken skin, following contamination with soil or water [5]. This bacterium produces a natural antibiotic called violacein, which is useful for treatment of colon and other cancers [5]. Violacein also has antibacterial, antiviral property. Antibiotic aztreonam (monobactam) is a natural metabolic product of *Chromobacterium violaceum* [6]. Infection in humans is not common; and mostly overlooked by physicians as this bacterium is rare. It is diagnosed clinically by purplish lesion and dark purple colored colonies in culture [7]. We have reported here a case of *Chromobacterium violaceum* infection in a 9 years old male child who gave history of trauma of right toe while playing outside.

2. Case Presentation

In June 2021, a boy aged 9 years was admitted to Medical College for Women and Hospital (MCWH), Dhaka, with history of trauma of right middle to be 15 days back while he was playing as shown in **Figure 1**. He was initially admitted to paediatrics ward. Later he was referred to surgery department of MCWH. He was treated with injection ceftriaxone and inj.flucloxacillin, injection ketorolac, and injection esomeprazole and oral paracetamol. He was operated on 21.6.21 at 11 am under local anaesthesia. The name of operation was wound debridement. On examination, appearance of wound was gangrenous. Surgeons at first thought it was necrosed tissue due to dark color of the wound, but later found healthy tissue, so amputation was not required. *Chromobacterium violaceum* produces pigment called violacein which is responsible for dark purplish wound color. The boy was otherwise healthy. His chest X-ray was clear and tuberculin test was negative. Complete blood count showed rise in total count of WBC (**Table 1**). The wound was swollen, tender & there was discharge of pus. Pus was sent to microbiology laboratory for culture and sensitivity. Initially culture showed no growth of bacteria. A repeat culture was again sent to same laboratory, where there was growth of *Chromobacterium violaceum*. In microbiology laboratory, the sample was cultured in blood-agar, MacConkeys agar media showing typical dark purple colored colony (**Figure 2**). Microbiological and Biochemical test was done [8] (**Table 2**). Antibiotic susceptibility test was done by Kirby-Bauer disc diffusion method on Mueller Hinton agar media and result was interpreted according to Clinical Laboratory Standards Institute (CLSI) guidelines for Enterobacteriaceae Gram negative bacteria [9]. Antibiotic sensitivity revealed resistance to ceftriaxone, ceftazidime and sensitivity to ciprofloxacin, linozolid, meropenem, gentamicin, aztreonam and intermediate sensitivity to pipercillin tazobactam (**Figure 3**, **Table 3**). His dressing was done regularly under aseptic procedure and discharged from hospital after total 8 days of hospital

stay. Oral medication of cefixime and ciprofloxacin were given at the time of discharge. The patient was advised to come to hospital for change of dressing.

Figure 1. Injury of right middle toe showing dark purple colored pigment.

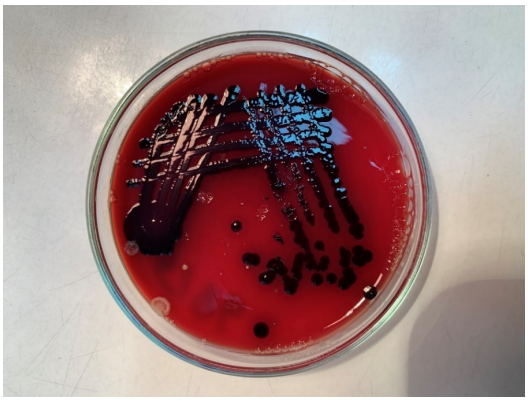

Figure 2. Growth of *C. violaceum* in blood agar media.

Figure 3. Antibiotic sensitivity test in Mueller Hinton Agar media: Kirby Bauer Disc Diffusion Method.

Table 1. Hematology test result.

Test parameters	Unit	Result	Reference value [14] [15]
Hb	gm/dl	10.3	Male: 10.7 - 14
ESR	mm/1sthr	75	Male: 0 - 10
Total WBC count	cumm	11,900	4500 - 13,000
N	%	72	30 - 77
L	%	20	14 - 50
M	%	06	4 - 9
E	%	02	0 - 5.8
B	%	0	0 - 1
Total platelet	cumm	336,000	1.5 - 4.5
RBC	M/µl	4.05	3.99 - 5.21
MCV	fl	76	76 - 94
RDW	%	5	11.6 - 14.8

Table 2. Microbiological and Biochemical test reports.

Test	Interpretation
Oxidase & Catalase	Positive
MIU (Motility, Indole, Urease)	Motile, indole negative, urease negative
Simmons citrate	Negative
Gram stain	Gram negative rod
Culture (MacConkeys agar, blood agar)	Dark purple colored colony
Antibiotic sensitivity (Mueller Hinton Agar Media)	Kirby Bauer technique, showing typical dark purple colored colony.

Table 3. Antimicrobial susceptibility pattern.

Antimicrobial agents	Interpretation	Zone of inhibition (mm)
Ciprofloxacin	Sensitive	≥21
Levofloxacin	Sensitive	≥17
Meropenem	Sensitive	≥23
Gentamicin	Sensitive	≥15
Amikacin	Sensitive	≥17
Pipercillin + tazobactam	Intermediate	18 - 20
Ceftriaxone	Resistant	≤19
Ceftazidime	Resistant	≤17

3. Discussion

Chromobacterium violaceum is a rare bacterium present in environment that

causes life threatening infections in humans and animals. In October 2017, a Bangladeshi farmer was hospitalized with high grade fever due to an agricultural injury related wound infection [4]. Another case was reported at a tertiary care hospital in Dhaka, Bangladesh, where *C. violaceum* was isolated in a 40 years female, who was diagnosed as pyrexia of unknown origin. The patient was later intubated and kept on mechanical ventilation as she developed pulmonary hemorrhage, hematuria and septic shock [3]. The patient ultimately died due to multiorgan failure. According to different review, *C. violaceum* cases were reported from 5 continents, showing the worldwide distribution. *C. violaceum* is distributed in tropics between 35˚ latitude in the north and south [7]. From different review, *C. violaceum* infection cases predominantly occurred in young male patients, indicating group of people who are active outdoors and prone to injury [1]. Most common routes of infection are contact with water, through skin injury or ingestion [10]. It can be transmitted through inhalation of dust outdoors causing pulmonary infection with *C. violaceum*. This bacterium can cause nosocomial infection and be found in hospital equipments such as.catheters [11] and venturi masks [12]. *C. violaceum* has been reported from wound over scalp [5] and urinary tract infection and septicaemia in India [6]. *C. violaceum* infection was also reported from patients in Nepal causing upper UTI [11].

Our patient was 9-year boy, had injury while playing, so acquired infection most probably from soil. The patient was otherwise healthy. He responded well to combined antimicrobial treatment (combination of cefixime and ciprofloxacin) and surgical debridement. He was cured and discharged from hospital with follow-up. He was sensitive to Ciprofloxacin, Meropenem, Gentamycin, Amikacin. Intermediate sensitivity to Pipercillin + Tazobactam, resistant to 3rd generation Cephalosporins—Ceftriaxone, Ceftazidime (**Table 3**). *C. violaceum* is usually resistant to many antimicrobials but sensitive to Imipenem, fluoroquinolones, gentamicin, tetracycline, and trimethoprim-sulfamethoxazole [13]. With rapid diagnosis and timely treatment patient was treated successfully. In previous case reports *C. violaceum* has led to fatal infection and death. Early detection with initiation of proper antimicrobial therapy is critical for management of this emerging and life threatening infection. From different studies it is observed that *C. violaceum* is distributed in environment, but isolation rate is not so significant. *C. violaceum* is an emerging environmental pathogen that causes fatal infection in both humans and animals. It was observed in a Bangladeshi farmer who presented high-grade fever following agricultural related wound infection. Bacteriological and gene investigation revealed *C. violaceum* from wound discharge. The patient recovered after combined antibiotic treatment with meropenem and ciprofloxacin [3]. Another case was observed in Hongkong, in a 40-year-old man with wound infection, who was treated with multiple antibiotics but died soon after admission to the hospital. Epidemiological survey revealed *C. violaceum* as probable cause of infection [16]. So physicians should be aware of this bacterium in their practice especially in wound infections.

4. Conclusion

Human infection with *Chromobacterium violaceum* is rare. This is the first time the bacterium was isolated in our institution. Rapid diagnosis and the use of appropriate antibiotic for treatment is life-saving. As the bacterium is rarely isolated there is lack of awareness and knowledge among clinicians and microbiologists regarding this bacterium. Further intensive research work needs to be conducted in this regard.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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