CASE REPORT

Clostridium Tertium Isolated From a Necrotizing Soft Tissue Infection in a Diabetic but Otherwise Nonimmunocompromised Patient

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Abstract *Clostridium tertium* has historically been regarded as nonpathogenic, and its implication as the primary microbe in infectious etiologies remains unclear. Although there have been several reports of *C. tertium* isolated from blood, tissue, and other specimens, largely this population has consisted of patients with neutropenia, hematologic malignancies, or gastrointestinal disorders. Here we describe a case of a 39-year-old nonimmunocompromised man with a history of type 1 diabetes mellitus and intravenous drug use who presented to our institution with a necrotizing soft tissue infection involving his right upper extremity. The infection had developed after the patient had injected methamphetamines. At surgery, tissue was obtained for Gram stain and culture, yielding *C. tertium*, after an initial misidentification as *Lactobacillus* species. After undergoing extensive surgical debridement and treatment with an appropriate antibiotic regimen, the patient was able to be discharged home with retained function of his extremity. Although not common, infections involving *C. tertium* can produce severe, potentially life- and limb-threatening disease processes, which may require aggressive therapy even in the nonimmunocompromised patient.

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Case Presentation

A 39-year-old man with a past medical history significant for type I diabetes mellitus and intravenous drug use presented to the emergency department with a 3-day history of increasing right upper extremity erythema, edema, and significant pain. On being questioned, the patient admitted to injecting methamphetamines into the right antecubital

fossa just prior to the onset of symptoms. At the initial examination, only mild cellulitic changes were identified, and therefore he was given intravenous vancomycin and discharged home on a combination of oral cephalexin and trimethoprim/sulfamethoxazole. The following day, however, he represented with worsening symptoms and was admitted initially to the medical service, with surgical consultation obtained.

On examination, the patient was noted to be afebrile (97°F [36 °C]), with leukocytosis (18,300 WBC/μL) and relative euglycemia (blood glucose = 114 mg/dL); no evidence of hypotension (150/89 mm Hg), tachycardia (99 beats per minute), or tachypnea (16 breaths/min) was present. The entire length of the right upper extremity,

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extending from the chest wall to the fingers, was found to be markedly edematous (right biceps diameter, 43 cm; left, 23 cm) with associated erythema and tenderness. A 5-cm area of fluctuance was identified within the biceps muscle. Imaging studies had been performed by the emergency room (Figures 1 and 2) and demonstrated extensive right upper extremity and anterior chest wall inflammation and edema. An intramuscular abscess ($4 \times 4.5 \times 12$ cm) within the biceps and gas likely within the fascia were also identified. The patient was taken emergently to the operating room for wide debridement.

Intraoperatively, a copious amount of purulent material was released from the biceps muscle at incision. Once the incision was extended deeper, the muscle was found to be nonviable, and extensive myonecrosis and polymorphonuclear cell infiltrate were noted on histology (Figure 3). Further extension onto the chest wall and distal forearm was undertaken as fasciotomies were created. All necrotic muscle, fascia, and subcutaneous tissue were debrided until viable tissues were encountered. The volar aspect of the forearm and the triceps region were both inspected and found to be viable. A dressing was placed and the patient transferred to the surgical intensive care unit for postoperative care.

Initially, the patient had been placed on an antibiotic regimen of piperillin-tazobactam (3.375 g intravenously every 6 hours) and vancomycin (1 g intravenously every 12 hours), and Gram staining and cultures from the operative procedure returned as *Lactobacillus* species. On postoperative day 3, however, this identification was corrected to *Clostridium tertium* (aerotolerant), and the patient was then placed on penicillin G. No other organisms were identified on Gram stain or tissue culture. During his hospital stay, he subsequently underwent 2 further debridements, negative pressure therapy, and staged delayed primary closure of the wounds prior to discharge.

Figure 1 Coronal reconstruction of the CT scan upon admission demonstrating subcutaneous gas within the biceps musculature.

Figure 2 Axial sections of the CT scan upon admission demonstrating extension of subcutaneous gas into the proximal forearm.

Discussion

Clostridia species, in general, exhibit a wide spectrum of pathogenicity and clinical significance. Historically *C tertium* has largely been considered to be nonpathogenic, partly because of its lack of endotoxin production. Furthermore it

Figure 3 Hematoxylin and eosin stain (40 $\times$) of the biceps muscle, demonstrating diffuse myonecrosis with acute inflammation. (Photo courtesy Dr. Jeffrey Pierce.)

has been identified within the oral and fecal flora of humans, as well as within soil.¹ However, its pathogenic potential was first documented in 1963, when it was found to cause septicemia.² Since then there have been several other reports implicating *C tertium* in a wide variety of clinical processes, including brain abscess,³ spontaneous bacterial peritonitis,⁴ neutropenic enterocolitis,⁵ and bacteremia,⁶⁻¹¹ as well as septicemia.¹²⁻¹⁵ Moreover, it has been isolated as a pathogen involved in necrotizing soft tissue infections^{16,17} requiring extensive surgical debridement, as our case illustrates.

Throughout the literature, *C tertium* has been found to exhibit a propensity for infection in patients who are immunocompromised, neutropenic, or with hematologic malignancies or primary gastrointestinal disorders.^{5,6,8-11,13-16,18} There have been isolated reports of infection involving non-neutropenic patients^{12,17,18}; however, these seem to be the exception. Our patient, although diabetic, does not have any other risk factors for or history of neutropenia, hematologic malignancy, or gastrointestinal disorder. On presentation he was found to be euglycemic and had a history of relatively good glycemic control on his insulin regimen.

Because of its aerotolerant nature, there have been multiple reports of initial misidentification of *C tertium* as *Lactobacillus* species,^{12,17} as presented here. However, as *C tertium* is catalase negative and forms spores selectively under anaerobic conditions; these 2 factors are integral in making the appropriate identification¹⁶ and guiding treatment.

As the patient did receive antibiotics prior to undergoing excision, there is the possibility that other organisms may have played a role in the pathogenesis of the necrotizing soft tissue infection. However, *C tertium* remained the only organism to be detected via Gram stain and prolonged culture incubation, thereby suggesting that its presence was indeed pathogenic.

Management of acute necrotizing soft tissue infections revolves around the principles of early, wide debridement, appropriate antibiotic coverage, and supportive therapy addressing the patient's underlying physiological derangements. Despite its seemingly insidious nature, *C tertium* has gained momentum as a pathogen in the development of serious infections largely in immunocompromised, but also, less commonly, nonimmunocompromised, patients. Therefore, early recognition and treatment are essential to

prevent loss of life or limb when *C tertium* is encountered even in the nonimmunocompromised population.

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