

Clostridium perfringens in gas gangrene: Still a smoked gun!

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ABSTRACT

Gas gangrene (GG) remains a life-threatening and deadly disease. Early recognition together with daily surgical debridement remains the mainstay of therapy. We sought to describe a fatal case of necrotizing soft tissue infection, which was a gas gagrene in this case. This case was remarkable as two main sites were infected simultaneously in geographical zones very far from each other making dissemination between both sites almost impossible. The other particularity was the fact that the infection was caused at the same time by four different bacteria that is atypical in GG similar to that in streptoccocal necrotizing fasciitis where one bacteria is the causative agent (*Clostridium perfringens* for GG and group A streptococcus for necrotizing fasciitis).

Key words: gas gangrene, polymicrobial, bifocal,

INTRODUCTION

Gas gangrene (GG) caused by *Clostridium* species is a rare life-threatening infection with rapidly progressive invasion and destruction of soft tissue associated with gas production within tissues. Occasionaly, *Clostridium* is mixed with other aerobic and anaerobic bacteria.^[1] It is usually caused by traumatic injury; however spontaneous gas gangrene (SGG) is also reported, nearby always in patients with underlying diseases, especially gastrointestinal disease, and is typically caused by *Clostridium septicum*.^[2]

We describe the case of a patient with spontaneous bifocal GG caused by *Clostridium perfringens* associated with other bacteria, without evident underlying disease and with a fulminant and fatal course, despite rapid general tretment and surgical debridement. Surgical debridement remains the mainstay of the therapy for SGG.

CASE REPORT

A 62-year-old man without signifiant past medical or surgical history, no addiction, and taking no home medication presented to the emergency department (ED) with a history of pain and swelling of the left leg for 48 hours. On physical examination, the patient was pale, agitated, confused, and tachypneic and in distress from severe pain. Temperature was 37.8°C, pulse rate was 110/min, blood pressure was 185/100 mm Hg, and pulsed arterial oxygen saturation on room air was 96%. The left thigh and the right chest wall were notable for pain at palpation, for swelling, and of blue coloration (diffuse hematoma) with crepitus.

The laboratory studies revealed an anemia with an hemoglobin level of 4.6 (12–16) g/dL, a white blood cell count of 7.34 (4–12) K/μL, a platelet count of 198 (150–450) K/μL. INR was 1.39. There was a metabolic and lactic acidosis [pH: 7.24 (7.38–7.42); bicarbonate: 4.6 (24–28) mmol/L; lactate: 12.4 (0.66–2) mmol/L] and a renal failure [creatinine: 1.99 (0.7–1.3) mg/dL; urea: 10.5 (4.6–16.8) mmol/L]. C-reactive protein was 182 (<0.5) mg/dL, serum glucose was 333 (60–100) mg/dL, creatin kinase was 11,786 (<190) IU/L, troponine T (HS) was 6.4

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Access this article online

Website:

www.intern-med.com

DOI:

10.2478/jtim-2020-0009

Quick Response Code:



(<14) ng/L, AST was 520 (<40) IU/L, ALT was 339 (<41) IU/L, alkaline phosphatases was 227 (40–129) IU/L, and total bilirubin was 6.7 (0.2–1.2) mg/dL.

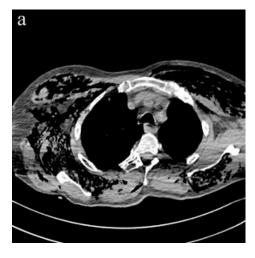
An electrocardiogram showed a sinusal tachycardia without signifiant ST segment or T wave abnormalites.

The chest X-rays (Figure 1) showed an important soft tissue swelling predominant on the right chest wall with bilateral subcutaneous emphysema, without pulmonary parenchymatous lesions. The computed tomography scannner of chest, abdomen, and thighs (Figure 2a and b) showed the soft tissue and subcutaneous empysema of the chest wall and the same major lesions on the left thigh. There was no continuity between these two lesions.

The diagnosis of necrotizing fasciitis and gas gangrene was considered, and emergent surgical consultation was obtained. Despite immediate intravenous antibiotherapy (clindamycin, amoxycillin–clavulanate acid, and amikacin



Figure 1: Chest X-ray showing soft tissue swelling with internal gas density predominant on the right chest wall.



25 mg/kg), abundant perfusions of crystalloid and colloid fluids, and blood transfusions, the situation deteriorated rapidly necessitating instauration of mechanical ventilation and inotropic support.

Thirty minutes after the first medical contact, the patient was admitted to the operating room (OR), but cardiac arrest occurred on his admission in the OR. After cardiopulmoary resuscitation, the patient was momentarily stabilized with high doses of catecholamines, but a second cardiac arrest occured during surgery. The patient died 2 h after his admission to the hospital.

Later *C. perfringens* (sensitive to clindamycin and penicillin), *Escherichia coli* (sensitive to amoxycillin–clavulanate acid and amikacine), and *Enterococcus faecalis* (sensitive to penicillin) were isolated from blood cultures. *E. coli*, *E. faecalis*, and *Klebsiella pneumoniae* (sensitive to amoxycillin–clavulanate acid and amikacine) were isolated from the cultures of tissue aspirated fluids in the OR.

An autopsy was performed and showed an extensive myonecrosis of the chest wall and thigh but neither neoplastic lesion nor perforation of the digestive tract.

DISCUSSION

Skin and soft tissue infections (SSTIs) are common and form a broad group of infections, ranging from mild to life-threatening ones. Necrotizing soft tissue infections (NSTIs) are the most severe form of SSTI, have a very rapid progression, and require immediate medical management and surgical debridement. NSTI remains uncommon with an incidence of 0.4/100.000 but seems to be increasing with a reported mortality as high as 73%. [3] NSTI can be

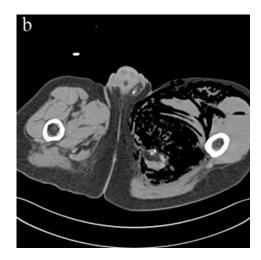


Figure 2: (a) CT scan showing massive infestation of the bilateral thoracic wall with sucutaneous emphysema. (b) CT scan showing massive myolysis of the left thigh with subcutaneous emphysema.

mono- or polymicrobial, caused by aerobic, anaerobic, or a combination of aerobic and anaerobic microorganisms. Typically Group A (and sometimes group G) Streptococcal necrotizing fasciitis^[4-6] is monomicrobial as GG is caused by *C. perfringens*.

GG is a life-threatening infection of the soft tissues, characterized by rapidly progressive muscular necrosis and gas production within the tissues. It is a well-recognized complication of trauma and penetrating (intrabdominal) wounds (e.g., war wounds, wounds caused by motor vehicle accident, and illegal abortion) or surgical intervention. In a literature review, [2] 49% of GG occurred after injury and 35% after surgery. It occurred spontaneously in only 16% of the cases.

The most frequently responsible pathogens are *Clostridium* species; six members of the clostridia species can invade muscle and cause myonecrosis in humans:^[7] C. perfringens, C. septicum, Clostridium haemolyticum, Clostridium oedemateus, Clostridium Novyi, and Clostridium histolyticum.

C. perfringens and C. septicum are responsible for the majority of the infections: C. perfringens accounts for 80–95% of cases after injury or surgery, [8] whereas SGG is almost exclusively caused by C. septicum. [7,8]

Clostridium are large gram-positive anaerobic bacilli and are nonpathogenic bacteria of the normal gut flora in humans. Spontaneous infections can be attributed in some of the cases to an impaired gut barrier (bowel malignancies, diverticulitis, translocation, etc.) and infections with C. septicum are linked to malignancy, immunosuppression, or diabetes mellitus. [7] SGG is also primarly found in the eldery. We did not measure the level of glycosylated hemoglobin. The patient had no antidiabetics or insulin before entering the hospital. However, we cannot rule out defintively that this was a GG secondary to an unknown diabetes mellitus.

Our patient's presentation is atypical by several aspects: possible spontaneous character of the infection, without traumatism or surgical intervention, the absence of evident underlying disease; although not fully certain regarding possible unknown diabetes mellitus, GG confirmed by the autopsy, multifocal localization, and the combination of four different microorganisms, aerobic and anaerobic, atypical in GG.

This case also draws attention to rare but increasing lifethreatening infections that need immediate diagnosis and treatment with surgical debridement.

Conflict of Interests

The authors declare to have no competing interests.

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How to cite this article: Preseau T, Deviendt J, Duttman R, Attou R, Franck D, Claeys R, et al. Clostridium perfringens in gas gangrene: Still a smoked gun!. J Transl Int Med 2020; 8: 54-6.