

A CASE REPORT OF GAS GANGRENE CAUSED BY RARE TYPE OF CLOSTRIDIUM – CLOSTRIDIUM LIMOSUM

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Abstract: Introduction: Gas gangrene (GG) is a necrotizing soft tissue infection with extremely poor outcome. It is caused predominantly by Clostridium perfringens and is related with compromised immunity. Case report: We present a clinical case of 38 years old male with metastatic oesophageal cancer who developed gas gangrene as a site infection in the area of port-a-cath used for chemotherapy. Unfortunately, the patient died sooner after the admission and the performed surgery. Bacterial wound culture revealed Clostridium limosum – unusual type of Clostridium bacteria as a cause of the infection. Conclusion: Gas gangrene could be caused by different types of Clostridium Species. It has very high mortality rate even with timely treatment.

Keywords: gas gangrene, soft tissue infection, clostridium limosum

Field: Medical Science and Health

1. INTRODUCTION

Gas gangrene, also known as clostridial myonecrosis, refers to a serious muscle infection caused by toxin-producing clostridial bacteria, and the two terms are often used synonymously. The first clostridial species, Clostridium butyricum, was identified by Louis Pasteur in 1861. In 1892, Welch, Nuttall, and colleagues later isolated a gram-positive anaerobic bacillus from gangrenous wounds. (Chapnick & Abter, 1996)

The condition became especially prominent during wartime because of its high incidence in combat-related injuries, while cases among civilians were uncommon. During World War I, gas gangrene was reported in about 6% of open fractures and 1% of all open wounds. In subsequent conflicts, its incidence progressively decreased, dropping to 0.7% in World War II, 0.2% during the Korean War, and as low as 0.002% in the Vietnam War.

(Gawande, 2004; Buboltz & Murphy-Lavoie, 2023)

Clostridia are widespread in the environment and are particularly abundant in soil, especially in cultivated areas. Their presence in soil significantly contributes to the development of gas gangrene following traumatic injuries. In civilian populations, the disease is more frequently encountered, with approximately 3,000 cases reported each year. Gas gangrene can be classified as post-traumatic, post-operative, or spontaneous. Traumatic cases account for about 70% of all infections, with Clostridium perfringens causing roughly 80% of these. Other causative species, in decreasing frequency, include C. novyi, C. septicum, C. histolyticum, C. bifermentans, C. fallax, and C. limosum. (Buttolph & Sapra, 2025)

Gas gangrene is a highly life-threatening condition associated with substantial mortality. Although recent reports indicate an average mortality rate of about 25%, the risk of death approaches 100% in spontaneous cases or when treatment is delayed.

Effective treatment relies on prompt, aggressive surgical debridement combined with the early administration of appropriate antibiotics. (Sharma, Tanveer & Dixit, 2022; Wang & Dai, 2013; De & Bhesania, 2003)

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2. CASE PRESENTATION

A 37-years old male patient with previous medical history for esophageal cancer with mediastinal and liver metastases (T3N2M1) was admitted to the Department of General surgery of the University Hospital "St. George" in critical condition on 7th of March in the morning.

On March 6th 2024:

- at 11:30 in the morning he underwent neoadjuvant chemotherapy through a right port-a-cath in hospital in Sofia and later in the afternoon discharged. He travelled back to his hometown.

- at 21:00 in the evening the patients complained of pain in the right shoulder and became febrile.

On March 7th 2024:

- at 08:00 am his right upper limb became edematous and the skin colour changed to dark-blue. His general condition worsened.

- at 11:30 he was admitted in our surgical department. His vitals during admission were following: Blood pressure - 80/40 mm Hg; Heart rate – 130 bt./min.; Respiratory rate: 24; Glasgow Coma Scale – 6 pts.(soporose). Patient's local status revealed skin necrosis with bullae and crepitations engaging the right upper limb, right shoulder and torso – gas gangrene. (Figure 1).

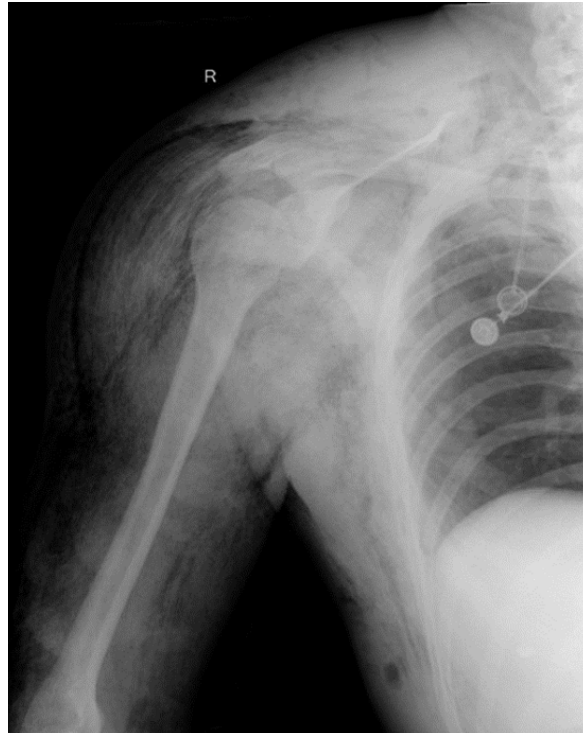
Figure 1. Gas gangrene - skin necrosis with bullae



Source: Authors' research

Relevant laboratory findings at the time of hospitalization were following: HGB – 121 g/l; RBC – 4.43; WBC – 1.72; PLT – 226; glucose – 2.3 mmol/l; CRP – 34 mg/l; t. protein – 14.1 g/l; CK – 4215 U/L; PT – 21.6%. X-ray of the chest and the right arm revealed air-collection in the soft tissues with diffuse subcutaneous emphysema (Figure 2).

Figure 2. X-ray of right arm with diffuse subcutaneous emphysema



Source: Authors' research

- at 11:40 the patient was intubated and immediate fluid resuscitation and broad-spectrum antibiotic therapy were initiated.
- at 11:45 damage control surgery with long and wide incisions with extensive debridement were performed and the intermuscular spaces of the right upper limb and torso were opened. (Figure 3)

Figure 3. Gas gangrene: damage control surgery – wide incisions with extensive wound debridement



Source: Authors' research

- at 11:55 the patient experienced cardiac arrest. Cardio-pulmonary resuscitation was performed according to the Advanced Cardiac Life Support protocol.
- at 12:35 exitus letalis was registered

A rare type of *Clostridium* species was isolated from the patient's wound – *Clostridium limosum*. Before hospitalization, the patients and his relatives provided their written informed consent for the further treatment and study participation.

3. DISCUSSION

Clostridium limosum is an anaerobic, Gram-positive, rod-shaped bacterium typically found in soil. It can cause infections in a broad range of hosts, including humans, cattle, alligators, chickens, dogs, and farmed mink. The organism has also been identified in home-cured meats and in diverse human clinical samples, such as blood, peritoneal and pleural fluids, soft tissue, and lung tissue. Previous research indicates that *C. limosum* is susceptible to several antibiotics, including chloramphenicol, erythromycin, penicillin G, clindamycin, and tetracycline. Despite its broad environmental presence, human infections caused by *C. limosum* are extremely rare, with only four cases previously reported in the English-language medical literature. These included two cases of prosthetic heart valve infection and two cases involving infected sacral pressure ulcers. In three of these reports, the organism was identified as part of a polymicrobial infection. (Lok Yung, 2019; Cato & Smith, 1970; Felner & Dowell, 1970; Gohari & McClane, 2021; Gordon & Axelrod, 1985; Shibuya & Takayasu, 1994)

Virulence factors attributed to *C. limosum* include collagenase, lecithinase, and toxins that target monocytes and macrophages. Although human infections are rare, they usually arise as part of polymicrobial infections. The current case represents the fifth reported human infection caused by *C. limosum* and only the second in which it was identified as the sole pathogen. Among the four previously documented cases, two were cases of prosthetic valve endocarditis, where *Pseudallescheria boydii* was also recovered from the prosthetic material. (Gordon & Axelrod, 1985) The remaining two cases concerned sacral pressure ulcers that progressed to gas gangrene; *C. limosum* was one of several pathogens identified, and both patients ultimately died. (Shibuya & Takayasu, 1994; Wu & Qu, 2024) Additionally, one study reported *C. limosum* among isolates obtained from 87 patients with skin and soft-tissue infections, identifying the organism in two cases. However, detailed information regarding these patients, including whether the infections were monomicrobial or polymicrobial, as well as treatment and outcomes, was not provided. (Gohari & McClane, 2021)

The clinical presentation of spontaneous *Clostridium limosum* infection is often vague and nonspecific, with manifestations that may include sepsis, abscess formation, soft tissue infection, endocarditis, neutropenic enterocolitis, or bacteremia. Spontaneous clostridial gas gangrene typically has an insidious onset, with localized pain at the involved site being one of the earliest symptoms. Classic signs, including crepitus and the development of bullae, usually emerge later in the course of the disease. Once systemic toxicity develops, rapid clinical deterioration may occur, frequently progressing to septic shock and death. The clinical spectrum of clostridial bacteremia is broad, ranging from asymptomatic cases with positive blood cultures to fulminant shock and fatal outcomes. Gas gangrene is primarily diagnosed based on clinical findings, although imaging studies demonstrating the presence of gas within affected tissues can aid in diagnosis. Definitive confirmation is achieved through microbiological culture. (Chapnick & Abter, 1996; Kousa & Millner, 2020) When gas gangrene is suspected, treatment must be initiated immediately, including early antibiotic therapy and urgent surgical management. Spontaneous infections caused by *C. limosum* are associated with extremely high mortality, with survival reported in only one of the five documented cases. (Lok Yung, 2019)

It is probable that our patient contracted *Clostridium limosum* during a portacath procedure performed the day before his emergency hospital admission, while undergoing chemotherapy. Possible contamination by healthcare personnel should also be considered. The infection likely entered through the portacath site in the right subclavian region, as the initial symptoms - pain, redness, and swelling - originated there and then spread to the right shoulder, arm, and torso. It is also likely that the symptoms observed upon hospital admission were signs of septic shock and coagulopathy, which ultimately contributed to the fatal outcome.

4. CONCLUSION

We report a clinical case of gas gangrene caused by the rare *Clostridium* species, *Clostridium limosum*. This type of infection is typically linked to immunocompromised conditions and underlying malignancies, and it has the potential to affect multiple organ systems. Despite prompt medical intervention, gas gangrene remains a highly lethal condition with a significantly high mortality rate.

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