Journal of Communicable Diseases
Volume 56, Issue 4 - 2024, Pg. No. 101-104
Peer Reviewed & Open Access Journal

Case Report

# Nontraumatic Gas Gangrene Caused by *Clostridium perfringens* - A Case Report

Preethi Kumar[1], Priyadarshini Shanmugam[2]

[1]PG Tutor, [2]Professor and Head, Department of Microbiology, Chettinad Hospital and Research Institute, India.
**DOI:** https://doi.org/10.24321/0019.5138.202478

## I N F O

**Corresponding Author:**
Preethi Kumar, Department of Microbiology, Chettinad Hospital and Research Institute, India.
**E-mail Id:**
mithran25112013@gmail.com
**Orcid Id:**
https://orcid.org/0009-0006-5921-9762
**How to cite this article:**
Kumar P, Shanmugam P. Nontraumatic Gas Gangrene Caused by *Clostridium perfringens* - A Case Report. J Commun Dis. 2024;56(4):102-104.

Date of Submission: 2024-07-01
Date of Acceptance: 2024-10-21

## A B S T R A C T

This article focuses on a case of nontraumatic gas gangrene caused by *Clostridium perfringens*. A 54-year-old female patient presented to the outpatient department with a sudden onset of swelling and pain over the right foot. She gave no history of trauma. The patient was admitted and treatment commenced. All diagnostics were performed for the patient. Culture from the foot ulcer yielded the anaerobic bacterium *Clostridium perfringens*, the causative agent of gas gangrene. Medical management and surgical intervention were done for this patient. The patient responded to the treatment and was discharged. This case highlights the typical presentation of nontraumatic gas gangrene emphasising the importance of high suspicion in patients without evident trauma. In conclusion, *Clostridium perfringens* causing nontraumatic gas gangrene is a serious condition that needs immediate recognition and intervention. So early diagnosis, medical management and surgical interventions were crucial for favourable outcomes, which can reduce the mortality rate of the patients.

**Keywords:** *Clostridium perfringens*, Gas Gangrene, Non Traumatic, Anaerobic Organisms, Emergency Fasciotomy

## Introduction

*Clostridium perfringens* is a normal inhabitant of the large intestine of humans and animals. It is found in the faeces and contaminants the skin of the perineum, buttocks and thighs. The spores are commonly found in soil, dust and air. The bacillus was originally cultivated by Achalme (1891) but was first described in detail by Welch and Nuttall (1892) who isolated it from the blood and organs of a cadaver. This is the most important of the clostridia causing gas gangrene. It also produces food poisoning and necrotic enteritis in human beings and many serious diseases in animals. Spores are usually destroyed within five minutes by boiling but those of the food poisoning strains of type A and certain type C strains resist boiling for 1-3 hours. Autoclaving at 121°C for 15 minutes is lethal. Spores are resistant to the antiseptics and disinfectants in the common use.

## Case Presentation

A 54 year-old female presented to the outpatient department with complaints of swelling over her right foot for the past four days. The medical history of this patient revealed that her foot had been normal until four days ago when she noticed the gradual onset of swelling. This swelling was progressive in nature and accompanied by a pricking pain. Subsequently, the patient was admitted to the surgery ward for further evaluation and management. Her past clinical history was remarkable, as she had been diagnosed with several chronic medical conditions for the past 27 years. These conditions included diabetes mellitus, hypertension,

and hypothyroidism. The patient had undergone a left below-knee, amputation due to uncontrolled diabetes, three months before the current illness.

On physical examination, a localised swelling measuring approximately 5 x 5 cm was observed on the medial aspect of the right foot, below the medial malleolus (Figure 1). The affected area displayed skin discolouration, indicating possible circulatory compromise or tissue damage. While there was no visible redness, ulceration, or open sinus with active bleeding at the site, the area was tender to touch, suggesting inflammation or localised infection. Peripheral pulses in the affected foot were feeble, indicating compromised blood flow to the area, raising suspicion of vascular insufficiency. There was no apparent warmth in the affected region.

A complete blood count performed showed a total count of 15,900 cells/cu.mm, RBS of 385 mg/dL, FBS of 187 mg/dL, PPBS of 293 mg/dL, sodium of 132 mEq/L , blood urea of 33 mg/dL, serum creatinine of 1.59mg/dL,Total Bilirubin -0.64 mg/dL,Direct bilirubin-0.14 mg/dL, Indirect bilirubin 0.50 mg/dL,SGOT/AST 37.70 U/L ,SGPT 30 U/L, GGT 30 U/L, Alkaline phosphatase 53 U/L, Total protein 7.05 gm/dl, Albumin 06 gm/dl, Globulin 3 gm/dl, HbA1C of 8.8 % , and CRP-reactive more than 200 Mg/L ; CXR and ECG were within normal limits. Procalcitonin was elevated at 24.29 ng/mL Urine culture showed no growth. USG Doppler of the right foot showed monophasic flow with forward diastolic component noted in the anterior tibial artery. APTT 30/Sec and PT 13/sec were within normal limits. HIV, HBsAg, and HCV were non-reactive.

Suspecting necrotising fasciitis or gas gangrene, an emergency fasciotomy was performed. Superficial femoral artery endarterectomy was also done. After commencing antibiotic therapy with clindamycin and meropenem (inj. meropenem 500 mg IV 12th hourly given for 3 days and inj. clindamycin 300 mg IV 12th hourly given for 5 days), the patient showed clinical improvement. The patient was also prescribed medicine for diabetes and hypothyroidism.

Following fasciotomy, a sample from the wound was sent for culture and sensitivity to the microbiological laboratory and it was inoculated into RCM medium (Figure 2). A thioglycollate liquid medium shows the anaerobic growth ( Figure 3) and the Gram stain showed occasional pus cells, epithelial cells, and stout Gram-positive bacilli without spores, morphologically resembling *Clostridium perfringens* (Figure 5). Reverse CAMP test was positive ( Figure 4).

After 5 days in the ICU, the patient was discharged. The patient was stable.

**Figure1.Patient's Foot showing the Necrotic Area and Unhealthy Non-Viable Tissue**

**Figure2.Robertson's Cooked Meat Medium showing Fermentation of Muscle Glycogen with Production of Gas**

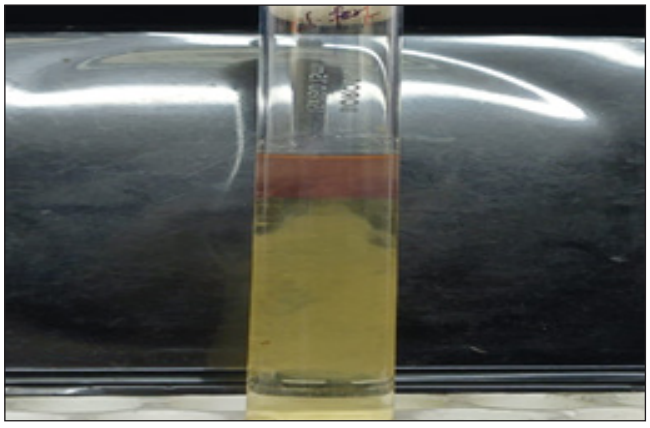

**Figure 3.Thioglycolate Broth showing Anaerobic Growth**

**ISSN: 0019-5138**
**DOI: https://doi.org/10.24321/0019.5138.202478**

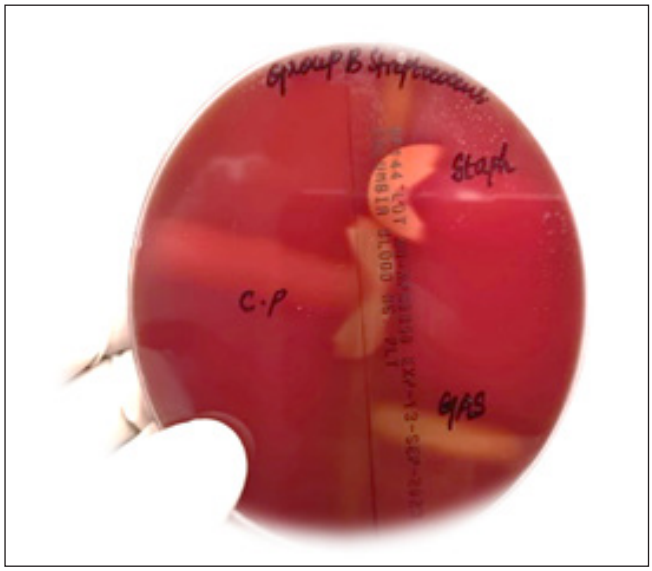


**Figure 4.Reverse CAMP Test showing Arrow Head Shaped Zone of Enhanced Haemolysis**

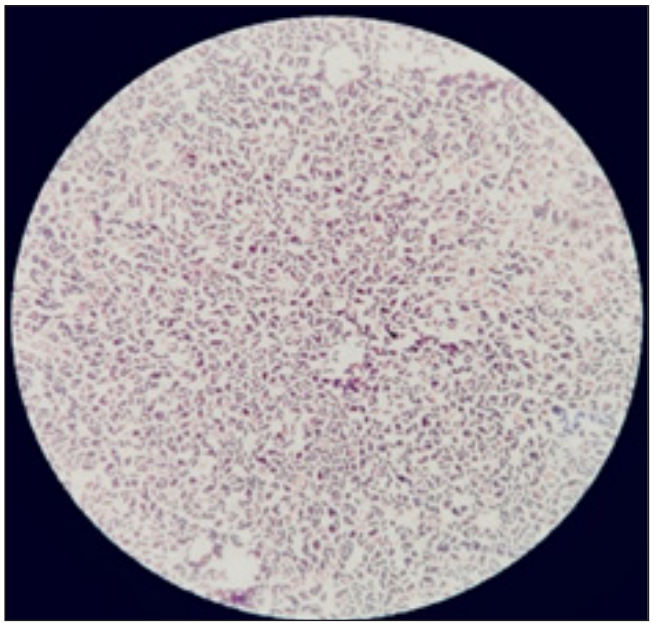

**Figure 5.Gram Stain showed pus cells, epithelial cells and Gram positive bacilli**

## Discussion

*Clostridium* spp., encompassing, *Clostridium putrificum*, *Clostridium sordelli*, *Clostridium novyi*, and *Clostridium perfringens* (*C. perfringens*) are the pathogens commonly associated with the life-threatening infection gas gangrene.[1] Gas gangrene predominantly manifests in skin and soft tissue infections and can be categorised into three primary types: post-operative, spontaneous, and - post traumatic. Historically, gas gangrene has been predominantly linked to trauma, often resulting from warfare or natural disasters. Additionally, cases of postoperative gas gangrene have been observed following surgical procedures such as cholecystectomy, duodenal papillary carcinoma, hilar cholangiocarcinoma, implant removal and bladder cancer. Furthermore, individuals with compromised immune systems, such as those with diabetes, cancer, undergoing chemotherapy, or suffering from ulcerative colitis, are at risk of developing spontaneous gas gangrene.

Gas gangrene represents a grave medical emergency, posing substantial risks to both life and limb.[1] While its conventional association is with traumatic injuries, there are instances in which this formidable infection emerges without any discernible trauma. In this report, we have presented a case of nontraumatic gas gangrene caused by *C. perfringens*. This intriguing occurrence underscores the necessity of an optimised environment for even the most virulent pathogens to incite infection. Although spontaneous nontraumatic clostridial myonecrosis caused by *C. perfringens*, remains exceedingly rare, it is noteworthy that the predominant causative agent in spontaneous cases of clostridial myonecrosis has historically been *C. septicum*.[2–4]

The patient's medical history included significant risk factors, coupled with a prior left leg amputation. This pivotal information led to the swift diagnosis of the patient's condition and immediate surgical debridement within a matter of hours following clinical deterioration. The importance of expeditious diagnosis cannot be overstated, as it profoundly influences the clinical outcome of clostridia cellulitis and myositis. Furthermore, the unique case presented here also highlights the importance of a multidisciplinary approach to patient care. The collaboration of various medical specialities, including infectious disease specialists, surgeons, and microbiologists, played a crucial role in achieving a swift and accurate diagnosis, including the identification of *C. perfringens* as the causative agent. Additionally, the rarity of nontraumatic gas gangrene caused by *C. perfringens* emphasises the need for ongoing research into the mechanisms underlying this unusual presentation. Investigating the specific factors that enabled *C. perfringens* to initiate infection in the absence of trauma can provide valuable insights into the pathogenesis of gas gangrene.[5] Such insights may inform preventive strategies and novel treatment approaches, especially in cases where gas gangrene may not be immediately suspected due to the absence of trauma. Yildiz et al. and Minutti et al. showed the development of nontraumatic gas gangrene by any of these risk factors like malignancy, intramuscular injections, colonoscopy, immunosuppression or neutropenic enterocolitis. So, the prevalence of spontaneous nontraumatic gas gangrene is high in patients with underlying diseases. In the literature review, gas gangrene cases were found in 35% of cases after surgery, 49% of cases after injury and 16% of cases that occurred spontaneously were typically caused by *C. septicum*, even though *C. perfringens* is the most common

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202478

cause of gas gangrene. In spite of a rapidly deteriorating clinical course, the mortality is reduced within 12–24 hours following prompt administration of high-dose antibiotics and surgical debridement. In case of suspected gas gangrene individuals who present with severe pain should be given immediate medical intervention without delay will increase their survival rate.[6,7]

Life-threatening skin and soft tissue infections (SSTIs) constitute a more frequent and challenging clinical condition to diagnose at initial presentation.[8] Among the gas-forming SSTIs, infection with microorganisms such as Clostridia, Coliforms and other anaerobes may cause the above clinical condition either alone or in combination. Clostridial myonecrosis or gas gangrene results from the production of exotoxin by the bacteria which invade the muscle tissue and in turn contributes to tissue destruction, necrosis, and production of gas.[9] Clostridia survive in an anaerobic environment like the large intestine. Most of the infections result from contamination of a wound by faecal flora, during the postpartum period and after septic abortions.[10] The pathogenesis is mainly due to hematogenous spread from an intestinal focus and the portal of entry is through mucosal ulceration or perforation of the GI tract.[11,12] Diabetes and peripheral vascular diseases result in tissue hypoxia which favours the colonisation and growth of bacteria. The bacterial toxins overcome the host defence system and trigger the cascade of tissue destruction processes like local ischemia, bacterial proliferation, toxin production, and necrosis.[13–15]

## Conclusion

Gas gangrene remains a formidable and undoubtedly fatal condition that demands immediate intervention. Here we have discussed a case of spontaneous nontraumatic gas gangrene caused by Clostridium perfringens. A multidisciplinary approach to patient care, swift diagnosis, and timely surgical intervention was pivotal in achieving a positive clinical outcome. Ongoing research into the mechanisms behind this atypical presentation may hold the key to improving our understanding of gas gangrene and refining its management.

**Conflict of Interest:** None

## References

1. Shah J. Hyperbaric oxygen therapy. The Journal of the American College of Certified Wound Specialists. 2010 Jan 1;2(1):9-13. Keval A, Whelan HT. Gas gangrene. In: Whelan HT, Kindwall EP, editors. Hyperbaric medicine practice. 2017 Jun 1. [Google Scholar]
2. Preseau T, Deviendt J, Duttman R, Attou R, Franck D, Claeys R, Honoré PM, Bels DD. *Clostridium perfringens* in gas gangrene: still a smoked gun! J Transl Int Med. 2020 May 9;8(1):54-6. [PubMed] [Google Scholar]
3. Neumann AP, Rehberger TG. MLST analysis reveals a highly conserved core genome among poultry isolates of *Clostridium septicum*. Anaerobe. 2009 Jun;15(3):99-106. [PubMed] [Google Scholar]
4. Stevens DL, Bryant AE, Carroll K. Clostridium. In: Jorgensen JH, Carroll KC, Funke G, Pfaller MA, Landry ML, Richter SS, Warnock DW, editors. Manual of clinical microbiology. 11th ed. Wiley; 2015 May 15. p. 940-66. [Google Scholar]
5. Thomas P, Abdel-Glil MY, Subbaiyan A, Busch A, Eichhorn I, Wieler LH, Neubauer H, Pletz M, Seyboldt C. First comparative analysis of *Clostridium septicum* genomes provides insights into the taxonomy, species genetic diversity, and virulence related to gas gangrene. Front Microbiol. 2021 Dec 9;12:771945. [PubMed] [Google Scholar]
6. Yıldız T, Gündeş S, Willke A, Solak M, Toker K. Spontaneous, nontraumatic gas gangrene due to *Clostridium perfringens*. Int JInfect Dis. 2006 Jan;10(1):83-5. [PubMed] [Google Scholar]
7. Minutti CZ, Immergluck LC, Schmidt ML. Spontaneous gas gangrene due to *Clostridium perfringens*. Clin Infect Dis. 1999 Jan;28(1):159-60. [PubMed] [Google Scholar]
8. Dylewski J, Drummond R, Rowen J. A case of *Clostridium septicum* spontaneous gas gangrene. CJEM. 2007 Mar;9(2):133-5. [PubMed] [Google Scholar]
9. Stevens DL, Troyer BE, Merrick DT, Mitten JE, Olson RD. Lethal effects and cardiovascular effects of purified α-and θ-toxins from *Clostridium perfringens*. J Infect Dis. 1988 Feb;157(2):272-9. [PubMed] [Google Scholar]
10. Dylewski J, Wiesenfeld H, Latour A. Postpartum uterine infection with *Clostridium perfringens*. Rev Infect Dis. 1989;11(3):470-3. [PubMed] [Google Scholar]
11. Leung FW, Serota AI, Mulligan ME, George WL, Finegold SM. Nontraumatic clostridial myonecrosis: an infectious disease emergency. Ann Emerg Med. 1981 Jun;10(6):312-4. [PubMed] [Google Scholar]
12. Kizer KW, Ogle LC. Occult clostridial myonecrosis. Ann Emerg Med. 1981 Jun;10(6):307-11. [PubMed] [Google Scholar]
13. Tehrani H, Gillespie PH, Cormack GC. Fatal multifocal metastasis of *Clostridium septicum*: a case report. Br J Plast Surg. 2004 Oct;57(7):673-5. [PubMed] [Google Scholar]
14. Harika DN, Rao TU, Sireesha P, Jithendra D, Pandu SS. A rare case of gas under diaphragm due to spontaneous perforation of uterus due to gas gangrene of uterus with *Clostridium perfringens* infection presenting as intestinal perforation. Int Surg Journal. 2019;6(8):3009-11. [Google Scholar]
15. Bryant AE, Stevens DL. Clostridial toxins in the pathogenesis of gas gangrene. In: Alouf J, Ladant D, Popoff MR, editors. The comprehensive sourcebook of bacterial protein toxins. 4th ed. Amsterdam: Elsevier Ltd; 2015. p. 977-94. [Google Scholar]

**ISSN: 0019-5138**
**DOI: https://doi.org/10.24321/0019.5138.202478**