International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Clostridial Gas gangrene - a lethal infection: A Cross-Sectional study

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OPEN ACCESS

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Received: 05-06-2026
Accepted: 22-06-2026
Available online: 07-07-2026

ABSTRACT

Introduction: Clostridial gas gangrene (GG) or clostridial myonecrosis is a life-threatening infection caused by clostridium species, Necrotizing fasciitis(NF) caused by Streptococcus pyogenes is an important differential diagnosis. It is difficult to differentiate between GG & NF in the early stages of the infection. Therefore, the purpose of this study is, to differentiate clostridial GG from other necrotizing soft tissue infections , to identify the etiology of GG and to evaluate the standard treatment and its outcome .
Methods: All patients diagnosed with clostridial GG between 1 January 2023 and 30 December 2024, in our institution were included in the study. All patients' medical records were reviewed retrospectively. Diagnosis was based on clinical, radiological findings, microbiological and histopathology results.
Results: Seven patients with GG were included in the present study . Four of them were male and three female, the median age was 35 years. Among these patient, two had a medical history of diabetes mellitus. Gas gangrene appeared in one patient in the pelvic region following septic abortion by quack. In two patients, infection started in the lower extremities following trauma. One patient developed GG in the gluteal region following drug injection at the site while the other developed GG in the pubic region subsequently to pubic hair removal. Two infections occurred in the upper extremities following trauma. In 4 cases, C. perfringens was found. C. septicum was found in two cases. C. histolyticum was found in one case. Out of these 7 patients, five required intensive care. Of the seven patients with GG, four died (mortality 57.14%) of multi-organ failure. Three patients survived (20%), however, the affected limb was amputated.
Conclusion: Gas gangrene, a fatal infection requires full immediate surgical, antibiotic and intensive care treatment with timely administration of anti-gas gangrene serum to prevent mortality and morbidity. We recommend that anti gas gangrene serum should be included in the national list of emergency drug and A separate portal should be made by all institutions and should be updated weekly so can be shared when needed.

Keywords: *Clostridium; Gas gangrene; Myonecrosis, Necrotizing fasciitis; Anti-gas gangrene serum.*

INTRODUCTION

Necrotizing soft tissue infections (NSTI) are identified by the presence of toxin-producing bacteria, extensive tissue destruction, and fulminant inflammatory progression, that leads to development of sepsis, multi-organ failure and also death in untreated patients[1]. On the basis the microbial agents involved, there are two types of NSTI. Type 1 which is a polymicrobial infection while type II infection is monomicrobial infection primarily caused by Streptococcus pyogenes resulting in necrotising fasciitis [1–3] . NSTI can involve any layer of the soft tissue, but the characteristic feature of necrotizing fasciitis (NF) is extensive necrosis of the fascia and the overlaying subcutaneous and skin tissue. However, in Clostridial myonecrosis, additionally to the above layers , muscles are also affected in the advanced stages of the

infection[4,5]. Clostridial gas gangrene (GG) or clostridial myonecrosis is a life-threatening soft tissue infection caused by anaerobic, spore-forming clostridium subspecies subsequent to traumatic injury but can occur spontaneously, frequently with the background of abdominal pathology or malignancy[6] .

The most common microbe that cause these infections are Clostridium perfringens, Clostridium septicum, and Clostridium histolyticum. C. septicum is the most common cause of spontaneous gas gangrene in patients with G.I. abnormalities, like colon cancer whereas C. perfringens and C. histolyticum are frequently associated with post-traumatic infections.[7,8]. Recently, an unusual pathogen , Clostridium sordellii, has been described to cause fatal shock syndrome and gas gangrene of the uterus after medical abortion with oral mifepristone and vaginal misoprostol, septic abortions and deep tissue infection after childbirth.[9-11]

Clinically, in the early stage of infection NF and clostridial GG have similar clinical presentation which is difficult to diagnose clinically. If the early diagnosis of Clostridial GG is missed, the infection often shows a dramatic course resulting in increased mortality. Therefore, the purpose of this study is, to differentiate clostridial GG (myonecrosis) from other necrotizing soft tissue infections by Microbiological investigation , to identify the etiology of gas gangrene and to evaluate the standard treatment and its outcome .

MATERIAL & METHODS:

Afters Ethics approval, the study was carried at a tertiary care hospital.

Patient Data: All patients diagnosed with clostridial GG over a period of 12 months, between 1 January 2023 and 30 December 2024, in our institution were identified and included in the study. All patients' medical records were reviewed retrospectively. Diagnosis was based on clinical, microbiological, radiological, and intraoperative findings, as well as on histopathology results. All patients underwent surgery interventions, microbiological as well as histopathological samples were collected intraoperatively and send to Microbiology laboratory for confirmation. Patients were analysed retrospectively in terms of demographic and social information (gender, age, and comorbidities). Isolated pathogens and corresponding treatment were reviewed. The way of admission, clinical presentation, the course of infection and treatment was investigated in terms of anatomical site, etiology, and medical outcome in terms of survival, organ and limb salvage, were evaluated.

Table:1 Demographic data, co – morbidies, admission, clinical features, microbiological findings, treatment and outcome

Patient no	Age	Gender	Co-morbidities	Clinical features	Cause	Way of admission	localization	Treatment	Pathogen	Outcome
1	20	F	Nil	Edematous blackish discoloration over pubic symphysis	Abortion by quack by using chemical over sticks	Referred for RHC	Pelvic region	Total hysterectomy,	Clostridium perfringens	Death
2	35	M	Nil	Edematous blackish discoloration over left ankle	Crush injury following road traffic accident	Referred from private hospital	Left leg	Below knee amputation	Clostridium septicum	Survived
3	24	M	Juvenile Diabetes mellitus	Edematous , blackish discoloration of the skin at the site	Injury over the sole of right foot with rusted nail	Direct admission	Right leg	Surgical debridement, symptomatic treatment	Clostridium perfringens	Death
4	40	F	Nil	Edematous , blackish	Injection at gluteal site	Direct admission	Left gluteal region	Surgical debridement, symptomat	Clostridium septicum	Survived

				discoloration of skin				ic treatment		
5	35	M	Diabetes mellitus	Blackish discoloration of the skin	Dry gangrene of the right hand	Direct admission	Right hand	Below elbow amputation & symptomatic treatment	Clostridium histolyticum	Survived
6	40	M	Nil	Edematous , blackish discoloration of skin with blisters	Injection over right deltoid	Direct admission	Right arm	Surgical debridement	Clostridium perfringens	Death
7	65	F	Diabetes mellitus	Foul smelling wound , Blackish discoloration of the skin with blisters	Shaving over pubic region	Direct admission	Pubic area	Surgical debridement	Clostridium perfringens, Clostridium septicum	Death

RESULTS:

Demographic data: Between January 2023 to Dec 2024, seven patients were diagnosed and treated for Clostridial GG in our hospital. Four of them were male and three female, the median age was 35 years. (Table:1)
Comorbidities: Among the patient with GG, two had a medical history of diabetes mellitus.

Location and etiology: Gas gangrene appeared in one patient in the pelvic region following septic abortion by quack. In two patients, infection started in the lower extremities following trauma. One patient developed GG in the gluteal region following drug injection at the site while the other developed GG in the pubic region subsequently to pubic hair removal. Two infections occurred in the upper extremities following trauma. (Table:1)

Clinical findings : At the time of admission, all the patients with GG had local skin symptoms including emphysema, blackish discoloration of skin, foul smelling discharge, swelling and pain. (Table:1)

Microbiology and Histopathology: In all patients, samples were taken in every surgical interventions for microbiological investigation. In all patients with GG, clostridia could be identified as causative agent. In 4 cases, C. perfringens was found. C. septicum was found in two cases. C. histolyticum was found in one case. (Table:1)

Therapy and critical care management: Patients were transferred or self-initiated presentation to the emergency department of our hospital. Out of these 7 patients, five required intensive care. Immediate treatment after admission included an algorithm-based therapy according to the recommendations of the Surviving Sepsis Campaign for septic shock [12].

Antibiotic treatment was most often started with imipenem, clindamycin, and metronidazole Additional supportive care, such as nutritional support and high dose therapy with Vitamin C (6 g per day), was carried out in all patients. Surgical treatment included multiple and extensive debridement and amputation. (Table:1)

Mortality, Outcome, and Complications: Of the seven patients with GG, four died (mortality 57.14%) of multi-organ failure. Three patients survived (20%), however, the affected limb amputation was done and the patient was transferred into rehabilitation after 13 days of intensive care treatment. (Table:1)

DISCUSSION:

Gas gangrene is mostly considered as a disease linked with war or other mass casualty conditions. The etiological agent of gas gangrene can be grouped into following different types: clostridial myonecrosis, clostridial cellulitis, non clostridial lesions imitating as gas gangrene. Clostridial myonecrosis is the ideal term to represent the clinical syndrome of true gas gangrene [13]. Identifying the type of Clostridium aids to predict mortality. With Cl. septicum , it is approximately 63% and 11% with Cl. welchii. [14] but there is no difference in the clinical findings between these two clostridial species

infections. Gas gangrene following IM injections is uncommon. Cases of myonecrosis have been reported following IM administration of adrenaline[15,16] and vitamin B12[17]. In our case, the source of clostridium could be the needle, syringe, contaminated injection fluid or the patients own skin flora. It should be kept in mind that even routine procedures like administration of IM injections can lead to dreaded complication like GG , therefore, all aseptic precautions should be prevent it. The setup of CSSD in hospitals and the introduction of use of disposable sterilized syringes have significantly reduced the infections but has not abolished the risk of infection that can be introduced by injections[15].

The basic principal to effective treatment for gas gangrene comprises of prompt recognition of the diagnosis and commencement of multiple therapy including supportive measures, antimicrobial therapy, and timely surgical intervention. Despite this, in a majority of cases of C. perfringens induced gas gangrene, radical amputation still remains the best choice of treatment [18]. If not controlled, it will always lead to systemic toxemia, hypotension, shock, multiorgan failure, and even death [19]. Hyperbaric oxygen therapy is suggested by some experts but is controversial because its effectiveness has not yet been well-known. Out of five patients only two survived as they received anti gas gangrene serum along with other treatment measures. For the other five patients anti gas gangrene serum was not available in the hospital even when it's a life saving measure. Probable reason for this is the anti gas gangrene serum is not included in the list of national emergency drug where other antisera like antisnake venom, anti tetanus serum, anti diphtheria serum are included.

CONCLUSIONS:

Based on the case presented in the paper and our review of the literature on gas gangrene , following points should be highlighted.

(1) Our emergency clinicians should be aware of this severe and potentially lethal infectious disease and should not delay treatment to save the patient's life.
(2) Strict aseptic techniques should be observed for even the most minor procedureas Clostridial spores are ubiquitous and can reside in hospital environments, possibly on surgeons' hands, patients' skin, topical application, and so on.
(3) Once gas gangrene is diagnosed, careful and adequate debridement should be started immediately with admistration of antigas gangrene serum is still the basis of treatment, along with antibiotics and all other supportive treatments.
(4) We recommend that anti gas gangrene serum should be included in the national list of emergency drug (NLED) in immunoglobulin and antisera section. A separate portal should be made by all medical colleges for the availability of antisera and should be updated weekly so can be shared when needed. Antisera should be purchased as per the prevalence of the disease in that area.

Conflict of Interest: Nil
Acknowledgement: Nil

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