

# Gas Gangrene at University of Nigeria Teaching Hospital (UNTH), Enugu, Nigeria

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## Summary

**Background** Gas gangrene (clostridial myonecrosis) is seen rarely in medical practice

This rarity, coupled with its dramatic presentation and often a devastating outcome, make each case of gas gangrene a spectacular and memorable experience in a physician's practice.

**Methods** This is a prospective study of suspected traumatic gas gangrene seen over a 5-year study period.

**Results** There were 33 cases. 15 of them, all from trauma to the extremities were confirmed as gas gangrene through microbiological data and pathognomonic myonecrosis seen at surgery.

**Treatment** This included resuscitation, antibiotic therapy and radical surgical debridement. Only one limb was salvaged, the rest had amputation. 3 deaths were recorded giving a mortality rate of 20%.

**Key Words** Gas gangrene, extremity, management, outcome

## Introduction

Gas Gangrene (Clostridial Myonecrosis) is a necrotizing, gas-forming process of muscle, associated with systemic signs of toxemia.<sup>1-9</sup> It is broadly classified into traumatic, non-traumatic or spontaneous, postoperative and uterine types.<sup>1</sup> Traumatic types include those arising from war wounds, wounds of civilian violence like gunshots, major traumatic wounds like those of road traffic and industrial accidents, and minor wounds like puncture, insect bites and intramuscular injections. In peace times, these constitute over 50% of cases of gas gangrene, the remainder being the non-traumatic, postoperative and uterine types.<sup>1</sup> Gas gangrene is rare.<sup>1,10,11</sup>

Throughout history, gas gangrene has been tied intimately to battlefield wounds.<sup>1,2,7</sup> But even in wars

nowadays, because of improved treatment in combat zones, there has been a gratifying reduction in the incidence of gas gangrene associated with war wounds; 5% in World War I, 0.7% in World War II, 0.2% in the Korean War, and 0.02% in the Viet Nam War.<sup>1,2,3</sup>

In civilian practice, it is obviously seen more rarely. Estimates of annual occurrence in the whole of USA range from 1000 to 3000.<sup>5,9</sup> In Great Britain, a case of gas gangrene is said to be seen in a general hospital every 2 years.<sup>1</sup> Referral centers admit approximately 10 cases per year.<sup>9</sup> In Enugu, estimate of incidence, to the author's knowledge has not been documented.

The rarity of gas gangrene and its dramatic presentation and often devastating outcome most times make each case a spectacular and memorable event in the personal experience of any physician.<sup>1</sup> The aim of this study is to review the cases managed and to compare the outcome of management with that of other centers.

## Patients and methods

A prospective study of consecutive patients with suspected gas gangrene admitted into an orthopaedic unit at the University of Nigeria Teaching Hospital, Enugu over a 5-year period from July 2000 to June 2005 was undertaken. University of Nigeria Teaching Hospital, Enugu is a major referral center in the eastern part of Nigeria.

The suspicion of gas gangrene in patients with wounds is based on prostration and other features of toxemia with marked pain and tense swelling of the involved limb with pale to darkish skin and multiple bullae on the surface and watery or any other foul-smelling discharge from the wound. The presence of crepitations around the wound, coldness distally in the involved limb or gangrene strengthens the suspicion.

Each patient on presentation had been evaluated, and data collected include biodata, the history of injury, the type of previous treatment if any and other associated complaints. Reasons for delays in presentation were also sought.

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Clinical examination done was noted with particular attention to the type of injury and its extent, the part of the body affected and its state especially degree of swelling, skin colour; tenderness, fluid discharge and presence of gangrene.

Diagnosis of gas gangrene was based on the clinical features, the presence of gram-positive rods with few or no inflammatory cells on microscopy of wound swab, but more importantly on finding of myonecrosis with the foul putrefying-flesh smell of the muscle and its exudates with or without gas observed during debridement.

## Results

Thirty three cases of suspected gas gangrene were reviewed but only 15 cases met the criteria for the diagnosis. Males were 13 while females were 2, giving a male to female ratio of 6.5:1. The age range of the 15 patients is 19 to 40 years with a mean of 31 years.

All the cases were as a result of trauma to the limbs; 14 gunshot wounds and one following a motorcycle accident with severe tissue damage and soiling. Five of the gunshots were from policemen; seven from suspected armed bandits, while two were from accidental gun discharges during burials. The lower limb was involved in 13 cases and the upper limb in 2.

The types of injuries sustained before gas gangrene developed include type 3A open fractures (n=7), type 3B open fractures (n=2), type 3C open fractures (n=3), brachial artery injury (n=1) and femoral artery injury (n=2). The duration between injury and presentation were within 24 hours in 3 patients, within 48 hours in 5. Three patients were seen on the third day. Two presented on the fourth day. One presented on the sixth day while 1 presented on the 7<sup>th</sup> day post injury.

The 8 cases that presented within 48 hours did not receive any treatment before presentation. Five cases that presented on the third and fourth days had received resuscitation without reasonable wound care while the two cases that presented on the sixth and seventh days had received treatment from traditional bonesetters. The 2 patients that presented on the sixth and seventh days, who also were initially treated by traditional bonesetters, had obvious gangrene of the involved lower limbs. In these two, there was oliguria as well, with urine output less than 30 ml/hr.

All the patients showed moderate to severe degrees of toxemia, which tended to be related to the type and size of injury and its duration. In all the cases, there were deep wound(s) in an extremity of varying

sizes and septic state, with marked tense and tender swelling with bullous eruptions on the surface of the limb especially around the wound. The limb looked cyanotic around the wound but lower down, it looked pale and was less warm and in some cases frankly cold.

In all the cases, microscopy of wound discharge showed Gram- positive rods with paucity of inflammatory white blood cells. Culture and sensitivity of the wound discharge yielded a variety of gram-positive and gram-negative organisms. The 2 cases with oliguria had blood urea and creatinine that were markedly elevated with deranged serum electrolytes. In all jaundiced patients, the serum bilirubin was raised. All the patients had hemoglobin level below 10g/dl.

Radical surgical debridement was done in all cases. All of them required an amputation except in one case involving the upper arm where limb salvage was possible. This case was among the cases that presented about 24 hours after injury. In all the cases, the wound was left open and dressed. Secondary wound closure was later done.

12 patients survived while 3 died, giving a mortality rate of 20%. Two of the 3 patients that died were those that presented on the sixth and seventh days after treatment by traditional bonesetters with severe toxemia and oliguria.

## Discussion

Strong suspicion of clostridial infections should be aroused when the cause and the circumstances of the wound are such that they are conducive for contamination, germination and growth of clostridial organisms whose spores abound. This was the situation of all the wounds entered into this study. They were of severe degree with gross soiling and damage to the soft tissues especially the muscles, and received inadequate wound care up to 24 hours or more after injury.

The diagnosis of gas gangrene is usually based on its clinical features, the supporting microbiologic data and, the demonstration of the myonecrosis at surgery.<sup>1,10</sup> In the 15 cases diagnosed as gas gangrene, clinical features were supported with microscopy of swab from the wound, which showed abundance of Gram-positive rods with paucity of polymorph leucocytes and extensive myonecrosis with the characteristic odour of putrefying flesh that was observed during debridement. However, deficiency in the microbiologic support in the form of inability to do anaerobic culture of swab from the wound to demonstrate the species of clostridium directly implicated in gas gangrene must be noted. But this is not enough to invalidate the diagnosis, as the confirmation of gas gangrene is said to rest ultimately on the finding of pathognomonic myonecrosis and the

foul putrefying-flesh smell during surgery.<sup>1,10,11</sup>

In the 5year study period, a total of 15 cases were seen, giving an average of 3 cases per annum.

In treatment of gas gangrene, combination of modalities of therapy has always been the rule. The indispensable ones are surgical debridement and antibiotic therapies.<sup>1,10</sup> Others that have been added at one time or the other, include the use of clostridial antitoxin and hyperbaric oxygen. In 1918, use of antitoxin prepared commercially from horse serum against toxins of five clostridial species known to cause gas gangrene was introduced.<sup>10</sup> It was used extensively during World War II with good result.<sup>1,2,8,9,10</sup> Later studies of the use of this horse serum showed lack of efficacy and high frequency of allergic reactions. Recommendation against its use was therefore made to the National Research Council and the U S Department of Defense, both of which endorsed it and its use and production have been discontinued and all current supplies are outdated.<sup>1,2,3,4,8,9,10</sup>

About 40 years ago, use of hyperbaric oxygen therapy was introduced but there has been no consensus on its use as some claim very good results while some are skeptical of its efficacy and benefits especially when considered alongside its side effects<sup>10</sup>

Surgical debridement and antibiotic therapy only were used in this study because these are the treatment options available in our center. Many centers have equally used only these two modalities with good results.<sup>1,4</sup>

General mortality for all types of gas gangrene is in the region of 25%<sup>1</sup>. Survival is related to many factors like age, sex, type of gas gangrene, its location in the body, length of incubation period, presence of renal failure or other underlying disease and the modalities of therapy combined during treatment<sup>1</sup>. Those that affect it positively are younger age, female gender, involvement of only the extremities, traumatic type of gas gangrene, incubation period <30 hours, absence of haemolysis and renal failure, and addition of hyperbaric oxygen to surgery and antibiotics in treatment<sup>1</sup>

Mortality of 20% was recorded in this study. Two of the 3 deaths occurred in the patients who presented very late, on the sixth and seventh days respectively, after they have been with traditional bonesetters. Both equally had renal failure. This mortality compares well with those of other centres<sup>1,4,10</sup>. Most of our patients were young and only the limbs were involved, except in the two deaths recorded where there was extension to the abdomen. Only one limb salvage was recorded, all the rest had amputation; giving an amputation rate of 93%. This high rate must be because of the severe nature of the injuries, the involvement of the limbs and late presentation.

The reasons for the delay in presentation are many and vary among patients according to their circumstances but one cogent reason is common to all of them. And that is the time wasted in obtaining police clearance in cases of gunshot injuries before taking them for treatment in a health institution.

It is concluded that traumatic gas gangrene especially those caused by gunshot injuries are the type of gas gangrene seen commonly in our locality and that delay in receiving appropriate treatment worsens its prognosis particularly, limb salvage.

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### *Re-operations*

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