

The use of oxygen in Fournier's gangrene

Michael C. Safioleas, MD, PhD, Michael C. Stamatakos, MD,
Ahmad I. Diab, MD, Panagiotis M. Safioleas, MD.

ABSTRACT

Fournier's gangrene is an aggressive form of necrotizing fasciitis of the perineal, perianal or genital regions, usually caused by a polymicrobial infection that includes virulent organisms. Over the last decades, we have treated 9 patients suffering from Fournier's gangrene using systemic chemotherapy with broad-spectrum antibiotics, and with extensive, sometimes serial surgical debridement. Recently in one case, in addition to treatment, we used locally 100% oxygen in daily doses with promising results in healing wound. Herein, we report this case with a brief review of the literature concerning pathogenesis, risk factors, and treatment approaches.

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Fournier's gangrene is a polymicrobial necrotizing fasciitis of the perineal, perianal, or genital regions. Predisposing factors included diabetes mellitus, steroids or chemotherapy, alcohol abuse, malignancy, and radiation therapy. The infection usually starts as local cellulites, which gradually destroy the fascial planes, leading to gangrenous changes. The disease begins insidiously with pruritus, and discomfort of the external genitalia, with fever. Besides pain, scrotal swelling, black or green plaques and septic shock could be added.

Rates of fascial destruction are as high as 2-3 cm/hour have been described. In this regard, early diagnosis and aggressive therapy are required to prevent the development of systemic sepsis. Except for wide surgical debridement, and use of antibiotics, many authors support the useful role of applying hyperbaric oxygen, but no mention of treatment by local oxygen 100% has been found in the English literature. In one case, we have used local application of 100% oxygen aiming to inhibit the overgrowth of anaerobes. It is a method that is simple, easy and safe, and in addition has proven to be absolutely efficient in our case.

Case Report. A 17 year-old man presented to the emergency department with a 48 hour history of pain in perineum area, after accidental trauma involving this region. The patient denied sexual activity. A physical examination revealed perineum bruising, accompanied by edema, tenderness with palpation and putrefactive smell. His temperature was 38.9°C, his pulse rate was 98/minutes, and his blood pressure was 110/75 mmHg. Laboratory tests revealed leukocytes count of $17.58 \times 10^9/l$.

As the diagnosis of Fournier's gangrene was made, we immediately started therapy with surgical debridement of perineum (**Figure 1**). The surgical trauma remained open. Cultures from tissue necrosis revealed a local infection of *Escherichia coli*, and *Enterobacter cloacae* sensitive to metronidazole and streptomycin. Therefore, the patient started chemotherapy using these antibiotics in the following dosages; 500 mg \times 2 for metronidazole, and 1 g \times 2 streptomycin, and dressing changes with povidone-iodine. Furthermore, post-operatively we applied local 100% oxygen daily for 2 minutes every 6 hours direct to the surgical trauma through a nappy (**Figure 2**). After 19 days, the trauma has healed successfully,

From the 2nd Propedeutic Department of General Surgery, Medical School, University of Athens, Laiko General Hospital, Athens, Greece.

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Address correspondence and reprint request to: Prof. Michael Safioleas, 7 Kyprou Ave, Filothei, 152 37 Athens, Greece. Tel: +30 (693) 7051824. Fax: +30 (210) 5534193. E-mail: diabahmad1@yahoo.gr



Figure 1 - Surgical debridement of perineum.



Figure 3 - Wound healing after 19 days from debridement.

and 40 days later the patient has recovered completely (Figure 3).

Discussion. One of the most challenging situations in the field of surgical infections are patients with perineal or genital cellulites. While many of these cases turn out to be minor, and are resolved with antibiotics, some of them may progress to a far more serious condition such as necrotizing fasciitis or Fournier's gangrene.

Fournier's gangrene remains a lethal infection of the genital, perineal, and perianal regions with a dramatic clinical course. Since its first description, much has been learned regarding the unknown aspects of the syndrome. It is no longer considered to be "idiopathic". Its anatomical and clinical features are well defined, and the portals of entry of causative organisms are well known.¹ Fournier's gangrene is probably the same disease as necrotizing fasciitis,



Figure 2 - Applying of local oxygen through the nappy.

which occurs in other parts of the body, but modified by the peculiar anatomy of the genitoperitoneum.² The pathology, which is rapidly progressive, is the result of impaired host resistance from reduced cellular immunity. This leads to suppurative bacterial infection caused by invasion of organisms normally commensal in that area. A thrombosis of small subcutaneous vessels occurs, and a combination of the 2 disease processes leads to the development of gangrene of the overlying skin.

The main portals of entry are colorectal, urinary, and iatrogenic.³ Local trauma, including from coitus, has also been described as being associated with the disease. In our series, a young man had a recent history of trauma in his perineal region during sexual activity. Diabetes mellitus, and chronic alcoholism are the most common underlying systemic disorders in association with the development of the disease.⁴ Immunosuppression has also been associated with an increased risk. Finally, this gangrene may be a presenting sign of an undiagnosed HIV infection. There has been some suggestions that poor socioeconomic conditions contribute to the development of Fournier's gangrene. This is does not appear to be true, and the disease does occur in affluent as well as poor communities, as evidenced by many reports from affluent regions in the United States of America and Europe.

Surgery is the primary treatment of choice.⁵ The aim is to resect all infected, and necrotic tissues (previously all patients should be given broad-spectrum antibiotics and hemodynamic support).

During surgery, an extremely aggressive approach with thorough drainage, and debridement of microscopically non-viable tissues is recommended. The fascia is also resected if it is involved. Partial or total scrotoectomy is often included. The wound is left open covered impregnated with povidone-iodine.

In addition, treatment with hyperbaric oxygen has been reported with mixed results in clinical practice, so the role of hyperbaric oxygen therapy needs to be clarified with prospective controlled trials. Recently, we have used locally 100% oxygen for 2 minutes every 6 hours with excellent results in rapid healing wound, and hospital stay. Although it is controversial, temporary fecal diversion in the form of colostomy is sometimes necessary. In our series, we did that in 3 cases because the sphincter was grossly infected. However, some authors believe that a colostomy is never necessary even if destruction of the perirectal tissues occurs.⁶ All patients should be given broad-spectrum antibiotics, and hemodynamic support. It is well known that chemotherapy is not a treatment without risk. The administration of broad-spectrum antibiotics (gentamycin-3rd generation cephalosporin) for a long period of time might cause aplasia, and the mortality in Fournier's gangrene depends largely on the degree of neutropenia, and the duration of aplasia. Mortality rates remain high, ranging between 6-67% despite the newer antibiotics and the well known "aggressive surgical debridement".^{1,7,8} The aggressive nature of the disease, underlying diseases, and the lack of early diagnosis are some of the reasons for the high mortality rates. Gangrenous infections from a colorectal source have a less clear form of presentation, leading to delay in diagnosis, more frequent and more severe myonecrosis, deeper extension, greater severity, and a higher mortality rate. Aggressive debridement has been associated with both low, and high mortality rates.⁹ Surprisingly, conservative management with systemic antibiotics and topical application of unprocessed honey has been associated with zero mortality.¹⁰ In our opinion, such observations are not robust, and should be put into perspective. The peculiarity of Fournier's gangrene is that both early recognition and treatment of the fasciitis and early recognition and treatment of the primary cause are mandatory for survival.

Today, Fournier's gangrene has an incidence of much higher than previously recognized, and in fact, the disease is no longer a rare entity. From

1989-2003, 1500 new cases have been published in the English language literature. Possibly, Fournier's gangrene was either underestimated or less frequently reported earlier. It appears from our experience and that of others that delay in the treatment of a perianal abscess or incomplete drainage has been a factor in a significant percentage of the cases presented. This indicates that medical or surgical awareness of the primary etiologic factors is still largely lacking.

In conclusion, improvement in survival can be achieved by maintaining a high index of clinical suspicion, bearing in mind that local signs are not always evident. Surgical debridement must be extensive, beyond the necrotic tissues, and if necessary serial.

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