Case Report

Role of Hyperbaric Oxygen Therapy in management of complicated case of Fournier Gangrene to improve patient outcome

Shiv Chopra, Department of General & gastrointestinal surgery, Tarun Sahni, Department of Internal and Hyperbaric Medicine, Indraprastha Apollo Hospital, New Delhi. Email: sshwetaa0186@gmail.com

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Abstract
Fournier’s Gangrene is a life threatening urosurgical emergency and a synergistic gangrene of scrotum. It is a rapidly progressive and devastating form of necrotizing fasciitis of perineal, perineum and genital area associated with high mortality and morbidity. Radical surgical debridement, broad spectrum antibiotics, negative pressure wound dressings and hyperbaric oxygen therapy are considered to be the cornerstone of treatment and contribute to improved outcomes. We present a case of 57 year old gentleman with Fournier gangrene whose case was complicated by presence of rare multiple bacteria and was successfully managed with early diagnosis, prompt measures and use of hyperbaric oxygen.

Introduction
Fournier’s Gangrene is acute, rapidly progressive and potentially fatal, infective necrotizing fasciitis affecting external genitalia, perineal and perianal region\(^1,2,3\). It is characterized by a synergistic, polymicrobial necrotizing fasciitis leading to the thrombotic occlusion of small subcutaneous vessels and the development of gangrene\(^4,5\). The disease affects all ages, both sexes and is more common in males. The predisposing factors which may contribute to development of disease are Diabetes Mellitus (DM), alcoholism, malignancy, immunosuppression, liver or renal disease\(^3-7\). It is associated with high mortality rates, hence urgent, aggressive and effective treatment of this condition is imperative to prevent fatal outcome\(^8-10\).
We report a case of 57 years old male patient suffering from Fournier’s gangrene who was successfully treated with broad spectrum antibiotics, early surgical debridement of necrotic tissues and adjunctive therapies such as vacuum assisted closure (VAC) therapy and hyperbaric oxygen therapy (HBOT).

Case Report
A 57 year old healthy male patient with five day history of fever, weakness, pain, swelling and pus discharge from his genital region presented to our unit. He denied recent trauma and had no nausea, vomiting, abdominal pain or dysuria. He was a hemodynamically stable patient with no clinical abnormality. Local examination revealed a tender scrotum with palpable crepitations throughout. His scrotum was hard, swollen, erythematous and the left hemiscrotum was gangrenous revealing a patch of green black necrotic skin with foul odor (Figure 1, 2). Blood and urine cultures were negative and sputum cultures revealed klebsiella species. Urea (62.5 mg %) and creatinine levels (0.9 mg %) was raised with random blood sugar levels of 340 mg%, though patient was non diabetic. A clinical diagnosis of Fournier gangrene was made and treatment with broad spectrum combination (meropenem, amikacin, teichoplanin and metronidazole) was initiated which was later adjusted to culture sensitivity of the microbial isolates. He underwent immediate scrotal exploration with extensive debridement of necrotic skin of scrotum and perianal region (Figure 3). Culture of debrided tissue sample revealed acute suppurative inflammation with detection of Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, Klebsiella and Aspirgillus flavus.

He underwent five subsequent surgical debridements, with twice daily dressings (betadine/H₂O₂/eusol soaks/5% acetic acid soaks). His blood urea and serum creatinine came within normal range and on postoperative day 16, he was discharged home.

On post operative day 21, both testicles showed greenish sheen with unhealthy granulation tissue and wound cultures identified strains of Pseudomonas Aeruginosa and Staphylococcus Aureus. Urine cultures revealed presence of Candida Albicans. Polymicrobial and antifungal medications (voreconazole, colistin) were added to the treatment regimen. Orchidectomy was not necessary.

Furthermore, patient underwent 10 days of VAC (kinetic concepts international, Texas, USA) and 10 sessions of HBOT (at 2.40 ATA pressure for 90 minutes once daily) on postoperative day 25 .Postoperatively day 36, edema resolved and patient made uneventful recovery thereafter.

All throughout patient was hemodynamically stable, ambulatory, pain free and afebrile. Patient was advised for scrotal reconstruction surgery, though he opted for the wound to heal by secondary intention with dressings at home.

With regards to Diabetes Mellitus, blood glucose level remained within normal levels with diet control and oral hypoglycemic as the only treatment.
Discussion

Fournier’s gangrene is a rare and a rapidly progressive necrotizing fasciitis of the perineum and external genital organs affecting both men and women\(^1\)-\(^3\). It is a polymicrobial infection complicated by presence of both aerobic & anaerobic organisms such as Escherichia coli, Streptococcus Pyogenes (Group A Beta Hemolytic), Pseudomonas Aeruginosa, Klebsiella Pneumoniae, Proteus Mirabilis, Enterococci, Bacteroides fragilis\(^4\)-\(^7\).

In our case, stabilization of the patient, usage of wide spectrum antibiotics, aggressive surgical intervention, VAC and HBOT was the principle of management. Korkout et al reported that the etiology was identifiable in 95% of cases and in our case poor hygiene and diabetes mellitus seems to be the responsible cause which was diagnosed accidentally during his presentation to our hospital.

Our case report discusses the supportive therapeutic value of HBOT and VAC in management of Fournier Gangrene. Their combination allows continuous improvement of local wound and persisting infection enabling final reconstruction. We report a case of Fournier’s gangrene complicated with presence of multiple aerobic and anaerobic microorganisms including rarely occurring Pseudomonas Aeruginosa. A study published in New Zealand Medical journal says that majority of patients had a mixture of causative organisms while the most common single organism were E. coli followed by Pseudomonas aeruginosa and Staphylococcus\(^4\). Pseudomonas aeruginosa may cause soft tissue infections with peri-vasculitis secondary due to bacteraemia but it is rarely associated with necrotizing fasciitis\(^5\),\(^6\).

Despite intensive antibiotic therapy, his infection did not subside. We conducted 10 sessions of HBOT and had very good results as the bacterial count came down. “Tayyab etal” showed in the study involving 11 patients the positive effects of HBOT in the treatment of Fournier’s gangrene. HBOT provides oxygenation to ischemic areas, thus limiting the spread of infection and reducing the need for further debridement\(^5\)-\(^7\). Hunt et al have demonstrated that oxygen adds to the effectiveness of antibiotics. In Pseudomonas aeruginosa infections HBOT has an additive effect with antibiotics, reducing morbidity and mortality\(^10\).

The effect of HBOT and VAC in management of infection in Fournier’s gangrene has been discussed in various studies in combination with antibiotics and has proved to be of value in treatment. HBOT have a direct toxic effect on anaerobic bacteria, increase wound perfusion and reduce bacterial contamination to optimize the wound bed for further intervention.

Many surgeons believe that fecal and urinary diversion is required to prevent wound contamination and is considered an integral part of management for patients requiring extensive debridement, especially if the infection arises in the anorectal region\(^8\). This case might have led to a severe and fast spreading necrotizing infection, but with early diagnosis, immediate surgery and HBOT, anorectal area was preserved and hence fecal diversion was not required. A routine urinary catheter was used.
In our patient, antibiotic therapy and adequate wound debridement were the mainstays of treatment but adjunctive use of HBOT and VAC proved to be optimal for wound bed preparation and improved general well being.

**Conclusion**

Our experience suggests consideration of association of surgical treatment; VAC therapy and sequential HBOT for this disease. We recommend more prospective clinical studies to be carried out to analyze this kind of approach in such life threatening disease.

**References**

7. Machado NO. Necrotizing fasciitis: The importance of early diagnosis, prompt surgical debridement and adjuvant therapy. NAJMS (2011) 3:3; 107
Figures

Figure 1

Figure 2

Figure 3