British Journal of Multidisciplinary and Advanced Studies, 6 (2),38-46, 2025
Health and Medical Sciences
Print ISSN: 2517-276X
Online ISSN: 2517-2778
Website: https://bjmas.org/index.php/bjmas/index
Published by European Centre for Research Training and Development UK

Fournier's Acute Gangrene of The Male Genitals: Diagnosis and Treatment of a Surgical Emergency

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doi: https://doi.org/10.37745/bjmas.2022.04282 Published April 15, 2025

Citation: Zuccon W., Viganò G., Alongi P., Tochap G.N, and Salinitri G.N. (2025) Fournier's Acute Gangrene of The Male Genitals: Diagnosis and Treatment of a Surgical Emergency, *British Journal of Multidisciplinary and Advanced Studies*, 6 (2),38-46

Abstract: *Fournier's gangrene is an acute pathological process of necrotizing fasciitis involving the male genitalia and the perineal region, often fulminant and rapidly progressive and with a high risk of morbidity and mortality. It is characterized by severe necrosis of loose tissues and in the majority of cases is due to a mixed infection of aerobic and anaerobic bacteria. It usually follows a genitourinary or anorectal - ischiorectal infection and presents predisposing factors such as diabetes mellitus, obesity or alcohol abuse. The syndrome is characterized by pain and especially by scrotal-genital swelling, also with the presence of exudative necrotic areas in the genitoperineal region. This serious pathology requires early diagnosis and timely treatment where the prognosis is often favorable if the therapy is synergic and multidisciplinary. In this work the Authors report a case of Fournier's syndrome of the male genitalia with the aim of describing the clinical, diagnostic and treatment aspects of this fearsome disease.*

Key words: Fournier syndrome, Necrotizing fasciitis, Acute gangrene.

INTRODUCTION

Fournier's gangrene is a relatively rare disease, an acute pathological process of cellulitis and necrotizing fasciitis involving the male genitalia and perineal region, in fact it is characterized by a serious phenomenon of necrosis of loose tissues, often fulminant with sudden onset and rapidly progressive. In most cases it is due to a synergistic polymicrobial infection, aerobic and anaerobic microorganisms, where the latter are responsible for necrosis of the subcutaneous tissue. It is a

subcutaneous infection that can occur in all age groups but is prevalent in men over 50 years of age. It can occur following triggering events and multiple predisposing factors. This pathology requires early diagnosis and timely treatment with antibiotic therapy and nutritional support, of immediate drainage and extensive surgical debridement of the affected regions and, in selected cases, hyperbaric oxygen therapy. In the various phases of care, continuous monitoring of carbohydrate metabolism, acid-base balance, hydro-electrolytic balance and liver and kidney function is mandatory. Necrotizing fasciitis of the genitals can lead to a high risk of mortality and morbidity, often requiring long periods of hospitalization and repeated surgical interventions, both demolitive and reconstructive. In this regard, the prognosis is often favorable when the therapy is synergic and multidisciplinary and therefore when surgery is started as early as possible.

CLINICAL CASE

A 58-year-old man presented to our Emergency Department for the presence of a scrotal swelling that had been worsening for 7 days with pollakiuria and urinary urgency for several months. The patient had a history of chronic bronchopneumopathy undergoing C-Pap therapy and for morbid obesity with food and alcohol abuse, without being diabetic in therapy or allergic to drugs. On clinical examination, the patient was feverish and there was a gross inflammatory swelling of the scrotum, extending to the right inguinal region and the perineum, painful and tender to digital pressure, not reducible and not expandable under stress, with the overlying skin hyperemic and edematous. Complete blood tests were normal except for a marked Neutrophil Leukocytosis (Wbc 22.25 10^9/L and Neutrophils 20.1 10^9/L), an increase in C-Reactive Protein (30.34 mg/dl), Procalcitonin (0.95 µg/L in a reference value >0.5 < 2 as a possible systemic infection) and blood Glucose 310 mg/dl. Bladder catheterization, urine and blood culture tests were performed. Subsequent Computed Tomography showed a thickening of the subcutaneous adipose tissue with multiple air coefficients (conspicuous air component of the right hemiscrotum) that develops superiorly along the right inguinal canal in the setting of Fournier's gangrene. (**Figures 1 - 2**).

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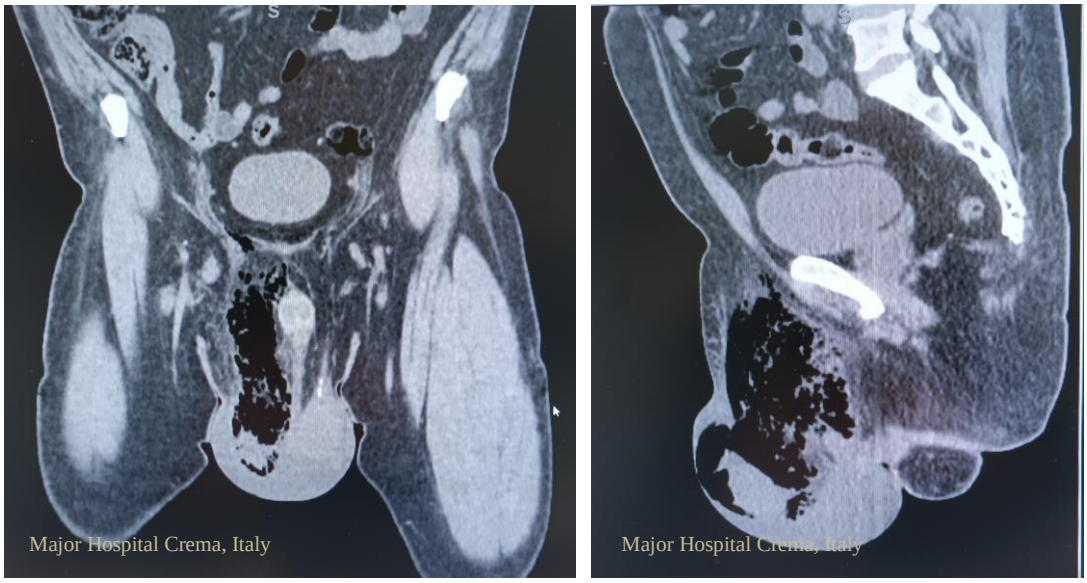

Figures 1 - 2. Fournier's gangrene by Computed Tomography of the male genitalia.

The patient was then subjected to emergency surgery (**Figures 3 - 4**). The procedure involved the incision of the right hemiscrotum with cranio-caudal inguinal and perineal extension, the dissection of the planes with lysis of phlogistic-necrotic septa, the exteriorization of the testicle with healthy normotrophic parenchyma and the drainage of the foul-smelling serum-corpuscular collection sent for culture and antibiogram (which was then positive for Enterococcus Faecalis). After abundant washing with physiological solution, povidone-iodine solution and hydrogen peroxide of the anatomical parts involved, a suction drain was positioned, the testicle was wrapped in hyaluronic acid-based gauze and repositioned in the scrotal envelope, the wounds were treated with hydrofiber antimicrobial packing and a flat compress of sterile gauze soaked in broad-spectrum antiseptic. The Patient was treated daily with advanced dressings and 4 surgical toilets using usual local washes and hydrofiber antimicrobial bandages while, once the results of the culture tests were received, the antibiotic therapy was appropriately targeted. In this regard, intravenous antibiotic prophylaxis initially involved the use of intravenous Piperacillin + Tazobactam with the addition of Metronidazole to ensure broad-spectrum antibiotic coverage, then a parenteral therapy of Vancomycin was subsequently set up due to the positive culture test for Enterococcus Faecalis sensitive to the latter antibiotic.

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Figures 3 - 4. Some clinical and intraoperative images of Fournier's gangrene.

The postoperative course was regular and favorable. During hospitalization, there was a progressive cleansing of the necrotic areas with gradual demarcation of the lesions and subsequent plastic reconstruction. The patient was discharged a month and a half later in good general conditions.

DISCUSSION

Fournier's gangrene was described in 1883 and is a relatively rare pathology characterized by severe necrosis of the subcutaneous soft tissues[1,2]. With sudden onset and rapidly progressive, it is initially localized to the external genitalia and in a short time the infection tends to expand to the surrounding anatomical structures such as the perineum, the perianal region and the abdominal wall; typically the infection spares the testicles[3]. In this regard, in cases originating from the genitals, the entry point of the pathogenic germs is likely a solution of continuity at the level of the fibroconnective Buck band that covers the penis, the infection then extends following the Dartos scrotal band, the Colles superficial perineal band and subsequently the Scarpa band of the anterior abdominal wall[4,5].

It affects both sexes and all age groups equally but is prevalent in men over 50 years of age and is often caused by a synergistic plurimicrobial action of aerobic and anaerobic microorganisms[6]. The etiology is multifactorial and includes both local predisposing factors such as trauma, surgical interventions (circumcision, vasectomy, hydrocelectomy, herniorrhaphy, ...) or infection extending from the perineal, perianal - ischiorectal or intra-abdominal region, and systemic predisposing factors such as diabetes mellitus, obesity, neoplasms and lymphoproliferative diseases, immunosuppressive and steroid therapies, alcoholism, liver cirrhosis and HIV seropositivity[7]. In

fact, conditions of local tissue hypoxia promote the growth of anaerobic germs and the proliferation of facultative aerobic germs and in the progression of this condition, the direct predisposing factors responsible for both an aggravation of chronic local hypoxia and the reduction of immune defenses are of particular importance[8].

As for the clinic, the picture can be characterized by asthenia and general malaise (nausea, vomiting, tachycardia and dyspnea), fever and pain with inflammatory perineal-scrotal swelling (reddish color) that evolves with the presence of exudative necrotic areas in the genito-perineal region (blackish color) up to extensive subcutaneous necrosis. A common feature is the crepitation of the inflamed tissues due to the presence of gas-forming organisms. The pain, sharp and unbearable in the early stages of the process, can then be replaced by sensations of paresthesia due to the early degeneration of the subcutaneous sensory endings involved in the colliquative-necrotic processes of gangrene[9]. Subsequently, a state of generalized septic shock with multiorgan failure or DIC - disseminated intravascular coagulation - can occur, which significantly influences mortality (it goes from a mortality rate of 20 – 30 % in the initial phase to about 70% in cases of severe sepsis) [10].

Some AA suggest the use of a prognostic index known as the Fournier's Gangrene Severity Index (FGSI) created to determine the severity and prognosis of Fournier's gangrene, quantifying the severity of the infection using common vital signs (temperature, heart rate and respiratory rate) and laboratory data (serum sodium, serum potassium, serum creatinine, serum bicarbonate, hematocrit and white blood cell count). The FGSI score should help prognosticate disease progression and predict mortality[11].

Instrumental diagnostics is based on the use of Doppler Ultrasound, an imaging modality useful for example to differentiate Fournier from inguino-scrotal hernias, MRI imaging and, especially in emergencies, Computed Tomography as it is specific in assessing the extent of the disease to guide the most appropriate surgical treatment[12,13].

The surgical management of this pathology is based on the fundamental principles of timely and aggressive surgical debridement of necrotized tissue and hemodynamic support with urgent resuscitation with fluids and broad-spectrum parenteral antibiotics. In fact, Fournier's gangrene is considered a surgical emergency since the progression of fascial necrosis has been noted up to 2-3 cm per hour. And it is for this condition that an early diagnosis and an immediate multidisciplinary treatment are established, such as the initial broad-spectrum empirical antibiotic therapy, then subsequently targeted, appropriate to the results of the culture tests and the antibiogram, the adequate hydroelectrolytic and nutritional intake, early incisions of the skin and subcutaneous tissue with surgical debridement extended to the affected necrotic areas and, in selected cases, hyperbaric oxygen therapy. In the various phases of assistance, continuous monitoring of glucose metabolism, acid-base balance, hydro-electrolytic balance and liver and kidney function is also important[14-16].

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The essential result of the surgical procedure is that it is as complete as possible, with accurate dissections and removal of all necrotic parts to avoid residual infections and sepsis. Orchiectomy is rarely required, however the male gonads should not be removed even if completely deprived of their natural vaginal and scrotal protection, provided that they maintain normal vitality. Temporary implantation of the testicle in an adjacent subcutaneous flap of the thigh, if there is significant loss of scrotal tissue, can provide a shorter hospital stay and reduce recovery times, allowing the patient more time to recover until the possible definitive scrotal reconstruction[17].

Adequate cleansing of all the anatomical parts involved is always necessary and, even in the following days, daily dressings or surgical debridement, which can be performed several times during the hospital stay in relation to the reappearance of necrotic areas, including washing with detergent and oxygenating solutions, must always be accurate, avoiding the removal of still vital tissue. In this regard, after initial radical debridement, postoperative open wounds are generally managed with conventional sterile dressings or, alternatively, with negative pressure wound therapies such as vacuum-assisted closure or VAC therapy, which exposes a wound to constant pressure for a prolonged period in order to create a favorable environment and promote debridement and healing, however clinically effective and used successfully in the management of large wounds[18].

Hyperbaric oxygen therapy, if in the absence of contraindications, is an adjuvant method of treatment of Fournier's gangrene and to date has contributed favorably to improve the prognosis of this fearful pathology. In fact, it has reduced the mortality rate, has optimized the dosages and times of use of antibiotic therapy, reducing them, and has assisted the surgical treatment that is less destructive than in the past. In a state of severe hypoxia and proximity to necrosis such as in this syndrome, the effects of hyperbaric treatment are referred to the improved oxygenation of the tissues, with consensual limitation of the extension of the infection, to the increase of the cicatricial activity with direct activation of the fibroblasts and to the increase of collagen synthesis, and a direct effect on microorganisms[19-20]. In the clinical case reported in this work, hyperbaric therapy was not performed due to absolute contraindications in a subject affected by chronic bronchopneumopathy undergoing C-Pap therapy.

After extensive debridement, patients present defects of the skin and soft tissues and therefore a reconstructive procedure is necessary to cover the wound in order to obtain satisfactory functional and aesthetic results. The objectives are simple and efficient coverage, preservation of the testicles using techniques such as thigh pockets, partial or full thickness skin grafts, or fasciocutaneous or musculocutaneous flaps, functional recovery of the penis and good cosmetics. However, the subsequent phase of surgical reconstruction resulting from this condition should be addressed by specialized teams due to the risk of dysfunctional sequelae and evident deformity due to cicatricial retraction[21].

CONCLUSION

Fournier's disease is an acute gangrenous infection of the genitals and perineum often associated with bacterial infection of the subcutaneous fat and superficial bands, with a potentially fatal course of the disease. Specifically, it can be compared as an obliterative endarteritis of the subcutaneous arteries that causes gangrene of the overlying skin where the point of synergistic polymicrobial infection of anaerobic and aerobic microorganisms is usually located in the genitourinary tract, lower gastrointestinal tract, or skin; predisposing and etiological factors provide a favorable environment for the proliferation of the infection. The underlying disease process, necrotizing fasciitis, has been identified in the perineum of women and children, although the disease most often affects men over 50 years of age. It has a potentially high mortality rate and the prognosis depends on many factors including the age of the patient, the extent of the disease and comorbidities. Treatment of Fournier's syndrome often requires a highly intensive multidisciplinary approach. In fact, early recognition of the disease, timely and extensive surgical debridement of all necrotic tissue, sometimes performed multiple times during hospitalization, along with adequate antimicrobial treatment and good supportive infusion therapy, as well as future reconstructive surgical procedures, are the cornerstones of the management of Fournier's gangrene to improve survival of these patients, thus reducing both morbidity, dysfunctional sequelae or obvious deformities, and mortality.

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Authors' Contribution

ZW and **SGN**: Planned work, conducted the literature search and produced the report.
AP: Reviewed literature and produced the report.
VG and **NTG**: Helped in contributed to produce the report.
ZW and **SGN**: Final revision before delivery.
All authors have reviewed the final report and approve its publication.

Conflict of interest

This work has no financial support by the creator or other sources. None of the authors have any conflicts of interest to disclose.

Ethical considerations

Support for this work has been entirely provided by institutional and / or departmental sources. Partecipants' data will be provided after approval by the Related Author and the Health Management of the Major Hospital, Crema.

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