Fournier's gangrene. Descriptive analysis of 20 cases and literature review

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Objective: To conduct a thorough descriptive analysis of risk factors and predisposing conditions for Fournier’s gangrene based on our institution’s experience over the past 12 years and reveal the mortality rate for those factors as well as the average number of reoperations performed.

Background: Fournier’s gangrene is a necrotising fasciitis that usually affects the external genitalia and perineal area and may extend to the abdomen, lower limbs and chest. It has a high fatality rate and must be treated aggressively within a few hours of being diagnosed. It is believed that debilitating diseases such as diabetes mellitus or obesity are conducive to its appearance. A perianal abscess is the most common trigger.

Material and methods: This observational retrospective study examines 20 patients, according to clinical inclusion criteria, who were diagnosed with Fournier’s gangrene, and treated in J.M. Morales Meseguer Hospital between 1997 and 2008.

Results: The vast majority of patients reviewed were males, with an average age of 61 years. All patients had a significant history of organic pathology, particularly diabetes mellitus. The average hospital stay was 25.7 days. 2 patients died, and the overall mortality rate was 10%.

Conclusions: Fournier’s gangrene is an entity that can be lethal and it is favoured by several debilitating factors. It is triggered by a urogenital or perirectal disease that has not been treated properly. Because of its poor prognosis, early diagnosis and an appropriate early and aggressive multidisciplinary intervention are essential for proper recovery.

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Introduction

Fournier’s gangrene is a type of necrotising fasciitis generally caused by polymicrobial infections. It affects not only the scrotum, as was described initially, but rather the general perineal area and may extend to the anterior abdominal wall, the lower members and even the thorax. Fortunately, this condition’s incidence rate is low, but its morbidity and mortality are high. For this reason, it must be understood in order to be treated in an early, consistent and aggressive manner.

Although it is true that it is most commonly found in males aged between 50 and 70 years, we now accept the possibility that both females and boys may be affected by this condition, unlike what was believed since Fournier’s time. Today, we believe that a clear trigger can be identified as the cause of 90% of all cases. The most common triggers are perianal disease, genitourinary disease, and lastly, local cutaneous lesions.

Once there is an entry point for microorganisms, the patient’s general conditions combined with the extreme virulence of the microorganisms in question trigger very serious infections in soft tissues. These infections raise the condition’s mortality rate to about 15%, according to the scientific literature, and in order to cure the condition, immediate surgical debridement is necessary, combined with proper metabolic support and potent antibiotic treatment that is as specific as possible.

Figure 1 – Erythematous scrotal lesion with tension and fluctuating tumefaction.
Material and methods

We carried out a review by means of a retrospective observational study of 20 patients diagnosed with Fournier’s gangrene between January 1997 and March 2008 in J.M. Morales Meseguer University Hospital in Murcia. Diagnosis was performed based on the clinical profile and physical examination; diagnostic criteria include the presence of fasciocutaneous necrosis with septic symptoms associated with crepitation and the characteristic odour of anaerobic lesions. For each case, we collected 30 data fields: affiliation data (clinical history number, year admitted), age, length of hospital stay, days between onset of the condition and beginning treatment, predisposing factors (diabetes mellitus, obesity, tobacco or alcohol abuse), pathological history (perianal, genitourinary or dermatological disease), profile on admission (pain, fever, hypotension, foul odour, tissue crepitation and spontaneous suppuration), analytical data upon admission (leukocytes, percentage of polymorphonuclear cells, platelet count and haemoglobin), result of the microbiology culture from the surgical sample, the antibiotic treatment used, number of reoperations, admission to and length of stay in the intensive care unit (ICU), major reported complications and mortality.

Results

The average number of cases per year was 1.66 (table 1). Most patients in the study were male (80% of all cases). The mean age was 61 years (ranging from 38 to 90 years). The mean hospital stay was 25.7 days, and lasted 66 days for the case with the longest evolution. The mean elapsed time between the onset of the condition and beginning septic shock treatment by means of extensive debridement - a fundamental factor when facing this disease - was 6.26 days.

With respect to the host’s systemic factors which may be qualified as debilitating and act as secondary risk factors, we listed four diseases; of these four, diabetes mellitus is the contributing factor appearing most often in our series and was present in 80% of the cases. Obesity was present in 55% of the patients and was linked to diabetes in most cases. 35% of the patients were smokers and only 20% presented alcohol abuse (fig. 2), although we were unable to access the necessary information about these last three parameters for all cases; for this reason, we believe that the numbers may be higher.

A local trigger was identified in 80% of the cases. The most common previous conditions were colorectal, in 62.5% of the secondary cases; complex perianal abscess was the most frequently found condition. A genitourinary affection was second, causing 31.25% of the cases; of these, the most common previous condition was a scrotal abscess. A cutaneomucous trigger was present in two cases (6.25%). The condition was idiopathic in 20% of the cases; this number is higher than usual, which is probably due to insufficient data gathering when the medical history was taken.

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Alc: alcohol habit; DM: diabetes mellitus; NA: not available; F: female; Reops: number of reoperations; TOT: time from onset to treatment; ICU: intensive care unit; M: male.
With regard to the initial clinical profile, all of the patients experienced pain and 90% arrived with a fever > 38º C. The onset of the disease was similar to localised cellulite; as the hours passed, the disease created necrotic cutaneous areas while extending nearby tissues, leading to local crepitation and a characteristic foul odour with the formation of gas by anaerobic bacteria. Spontaneous external suppuration was not a constant sign in our series; it only appeared in 45% of the cases. With respect to the initial arterial tension measurements at time of admission, only 35% of the patients presented significant hypotension, which was always in the context of severe septic shock. These patients were the ones that had to be hospitalised the longest, and most required admission to the ICU for haemodynamic stabilisation and control. Laboratory analysis showed very similar data for all patients, with haemoglobin levels above 9.5g/dl, platelets within the normal range, no alterations to the haemostatic system, and a tendency toward leukocytosis and left deviation.

The microbes that were isolated from cultures of purulent exudate, which was obtained during surgical operations (fig. 3) were polymicrobial in most cases. Cultures contained both aerobic and anaerobic microorganisms, generally bacteria and pertaining to the anogenital flora, although one patient also harboured Candida albicans. Of all of the cultured microorganisms, Escherichia coli was the most commonly isolated bacterium, appearing in 36% of the cultures. Bacteroides fragilis, Pseudomonas and Streptococcus viridans were isolated in 27% of the cases. Staphylococcus epidermidis, Peptostreptococcus, Klebsiella pneumoniae, Candida albicans and other microbes also appeared more infrequently.

After the first surgical procedure consisted of an extensive debridement and cleansing of the affected area. All patients underwent the procedure in an operating theatre under spinal anaesthesia; 80% of the patients required additional debridements. The mean number of procedures under spinal anaesthesia was two, with a maximum of five in one patient. All of the patients needing a high number of debridements had to be admitted to the ICU.

Severe complications included a wide range of afflictions closely related to septic symptoms and multiple organ failure; these occurred in several patients, especially those who required intensive care. There were four particularly difficult cases with severe heart failure and marked hypotension requiring high doses of vasoactive drugs; three had acute renal failure that required haemodialysis until renal parameters returned to normal, and two developed severe metabolic acidosis that had to be handled with extreme caution. In two patients, the tissue resection was so aggressive that they had to undergo protective colostomies; five patients had to undergo cystostomies for urinary derivation, and three patients required the assistance of the plastic surgery division in order to receive skin grafts to cover the areas with deficient skin integrity as a result of excising tissue.

40% of patients required admission to the ICU, with a mean stay of 10.62 days (range 3 to 35 days). When we analyse these patients, we observe certain common characteristics: all had long hospital stays, with a mean of 38 days (range 14 to 66 days) and most (87.5%) required new debridements in the operating theatre. Lastly the overall mortality rate in our series was 10%: two patients, one male and one female, both elderly (aged 72 and 90, respectively), with diabetes and obesity.

**Discussion**

A lethal case of scrotal gangrene was first described by Baurienne in 1764, but it was not until more than a century later, in 1883, when French dermatologist Jean Alfred Fournier studied and analysed five previously healthy male patients.
who presented a devastating syndrome of idiopathic scrotal gangrene. At present, the disease differs from its original description in a few points. At first, only elderly males were considered to be susceptible, but today we know that both men and women may present the disease, due to the disease’s definition having changed from scrotal to perineal. The age factor has also changed; cases have been described at very young ages as early as two months. From the first important studies carried out in the middle of the twentieth century, the average age of those suffering from the disease has increased, which is partly due to the longer average life expectancy of the entire population and the subpopulation with concomitant factors in particular, together with better control over those factors. In 1945, the average patient age was 40.9 years, and today it tends to be between 50 and 70 years; in our case, the mean age was 61 years. With regard to aetiology, cryptogenic cases of the disease have fallen to a mere 10%, and local processes have become more important. In 90% of cases we can identify a clear cause triggering the disease. The most common triggers are perianal disease, especially perianal abscesses, complex fistulas and anal fissures; genitourinary disease, such as urethral lesions, both in patients with and without a permanent urinary catheter; genitourinary infections, including postoperative infections of the genital area, and deformities such as hypospadia, and lastly, cutaneous lesions caused by trauma or infection.

Ever since Jean Alfred Fournier documented the first cases of this disease 125 years ago, case studies have been appearing in medical literature, generally in isolated articles, or series which normally have fewer than one hundred cases. The high number of published cases that appear sporadically around the world testify to the disease’s important, but fortunately infrequent nature, and it is interesting to learn about all of the documented cases. This fact, along with the disease’s lethalness, spurs us to learn about all of the available data in order to unify risk factors, predisposing underlying conditions and the most effective, beneficial treatment for the patient. In 2000, a systematic review was published regarding the 1,726 cases that existed in scientific literature at that time.

There is some confusion among many health care professionals as to the definition of this disease in daily clinical practice; at times, any necrotising fasciitis is called Fournier’s gangrene, even if it is not located in the perineal area. The most noteworthy anatomical pathology characteristics of all types of necrotising fasciitis, including Fournier’s gangrene, are necrosis and suppuration of subcutaneous tissue, subcutaneous fat, arteries, veins, superficial fascia, muscle, and deep fascia. This is accompanied by other, equally important signs, such as severe fat necrosis, severe inflammation of the dermis and subcutaneous fat, and often, focal haemorrhaging. The reticular dermis and subcutaneous fat often present as oedematous and infiltrated by abundant polymorphonuclear cells.

Fournier’s gangrene is therefore a necrotising fasciitis with a natural history that always begins with a rupture of the skin due to infection, trauma, laceration, burns, injections, bites or even surgical incisions, producing decompensation of the cutaneous defence mechanisms and creating an entry point for microorganisms. These pertain normally to the local flora and are of different types, the presence of aerobic and anaerobic microorganisms is almost constant. This infection can resolve itself satisfactorily when the host is healthy and his/her immune system responds correctly to the aggression. However, if a debilitating disease is present, or if the infection is particularly virulent, a subcutaneous cellulite occurs that rapidly evolves to become necrosis of the cutis and subcutaneous tissues. Local ischaemia, which
is favoured by thrombotic arterial and arteriole processes, facilitates the rise of a vicious cycle, making the body incapable of oxygenating tissues and favouring the arrival of cells and substances dedicated to fighting off the infectious process. In this way, the infection extends until reaching superficial and deep muscle fascia, and produces the disease’s characteristic purulent necrotising fasciitis. It has been shown that tissue gangrene can spread with the astounding speed of up to 2-3 cm/hour, meaning that a quick diagnosis and rapid surgical treatment are of vital importance. For that reason, one of the fundamental factors determining the disease’s development and severity is the mean elapsed time between the first symptoms and initiation of treatment. Therefore, it is essential that the disease be understood not only by the specialists who may encounter it, but also by primary care physicians. These doctors, who act as the first point of contact in medical treatment will therefore be able to improve the prognosis of these patients by decreasing treatment time through proper management of the disease from its onset.12

Diagnosis is fundamentally clinical; the major sign is a large perineal inflammation, frequently extending to the testicles in the male and the labia majora in the female, with the presence of subcutaneous crepitation caused by anaerobic bacteria generating gas and the possible presence of suppuration. This is associated with a high fever in the context of septic symptoms evolving over several days and probably treated with wide-spectrum antibiotics for a mild-seeming infection. Diagnosis may employ multiple radiological imaging techniques like simple genitourinary radiography, where we find engorgement of soft tissues associated with a radiolucent pattern indicative of interstitial gas in subcutaneous tissues, although it does not permit us to see if the fascia is affected (fig. 4); we also have genital ultrasound, which shows oedema of the affected wall with scattered hyperecogenic spots providing a typical dirty appearance due to subcutaneous emphysema, accompanied by unilateral or bilateral reactive hydroceles in males when the scrotum and the testicular stalks are affected. Computed tomography is the most sensitive and specific imaging test (fig. 5). The most frequent finding is subcutaneous emphysema, which appears in 90% of cases as a hypodense granular area. Therefore, although this symptom is usually present, we cannot rule out the diagnosis of Fournier’s gangrene when it does not appear. In addition, it can show the presence of subcutaneous fluid collection and extension of the fascia damage, neither of which can be seen using the other techniques.

The most typical risk factor for Fournier’s gangrene is undeniably diabetes mellitus, which was also the most frequently encountered predisposing factor in our study. We might expect that abuse of substances such as tobacco and alcohol would be very prevalent in patients who present this disease because of the accompanying immune deficiency, but as these parameters are not normally recorded in the patient’s medical history, other studies will have to confirm this correlation. As we can see, these risk factors are present in the pathogeny of this disease. Therefore, in addition to educating about acute treatment for Fournier’s gangrene, doctors and patients alike must be made aware of the importance of metabolic control, weight loss, and abstaining from substance abuse for preventing this disease.

The flora found in cultured purulent exudate from the affected zone, which was collected in the operating theatre during debridement, shows that most patients have a mixed polymicrobial infection with aerobic and anaerobic microbes. Escherichia coli stood out as the most frequent microorganism, which coincides once again with international series. Other microorganisms that we found include gram-negative and anaerobic bacilli pertaining to the cutaneous mucous flora in the genital area; this finding is also similar to those in the rest of the literature. In addition, we did find one
fungus, *Candida albicans*, as the only microbe isolated from one patient, although that patient’s evolution was not very different from other patients’; it is very likely that it was coexisting with other microorganisms. As we analyse the literature, we come across a case of Fournier’s gangrene described with a *Candida glabrata* infection. The existence of polymicrobial infections does nothing but support the idea of possible synergic action between microorganisms that combine pathogenic mechanisms in order to advance through subcutaneous tissue quickly.

According to the review of 1,726 cases carried out in 2000, the overall mortality of the disease is 16%, although other series place it within a wide interval of 20 to 80%. We observed a mortality rate of 10% in our series. If we explore the case of these two patients, we find that both were elderly at age 72 and 90. Both were diabetic and obese, thus presenting the two most frequent risk factors in our series.

At present, and according to published studies, treatment is based on initial surgery with extensive debridements and resections (fig. 6) to remove all necrotic or infected tissue, plus profuse cleansing and the use of wide-spectrum antibiotics. Metronidazole, carbapenem or third-generation cephalosporins are recommended before obtaining the specific antibiogram for the culture that was taken. Supporting these two basic pillars, successful treatment of Fournier’s gangrene may benefit from other techniques, such as early use of a hyperbaric oxygen chamber which increases tissue oxygen pressure to favour leukocyte activation, the stimulation of angiogenesis and increased transport of antibiotics into the cell interior. Lastly, reconstructive plastic surgery on the defects created by therapeutic surgery plays an important complementary role (fig. 7).

**Conclusions**

Fournier’s gangrene remains a serious condition with a mortality rate of about 10% despite new antibacterial therapy and raising awareness about its seriousness. It should be considered a surgical emergency requiring early diagnosis, whether by a primary care centre or a hospital. In most cases, an anorectal or genitourinary disease creates an entry point for a mixed polymicrobial infection, which usually consists of local native flora. Lastly, we would like to stress the point that in addition to employing an aggressive multidisciplinary treatment approach from the beginning, we must correct the risk factors that facilitate development of the primary infection. This includes avoiding tobacco and alcohol use, performing proper follow-up on diabetic patients, avoiding becoming overweight and treating perianal and genitourinary disease effectively and correctly.

**REFERENCES**


