

## Overview of Fournier's gangrene surgical treatment

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### Abstract:

Fournier's gangrene (FG) is a rare but life threatening disease. In this article we discuss the etiology, diagnosis and surgical treatment of Fournier's gangrene and reconstructive surgery after debridement. A comprehensive search was conducted through major databases; Ovid MEDLINE, Ovid EMBASE, Ovid Cochrane Central Register of Controlled Trials, through November, 2017. The search strategy used Mesh terms; Fournier's gangrene, surgery, management. Fournier's gangrene is an illness process with a wide variability in presentation. Aggressive surgical debridement remains to be the cornerstone of therapy in Fournier's gangrene, and it could be that those who are destined not to survive, can not tolerate the repeated debridement required for survival. A debridement of the necrotic tissue immediately it is commonly suggested Laor et al. discovered no significant difference in between the beginning time of symptoms, early surgical treatment and death, but various other studies from Kabay et al. and Korkut et al. reveal that this time interval need to be as short as possible. Debridement of deep fascia and muscle is not generally required as these areas are rarely involved similar to testes. After extensive debridement, many patients sustain considerable defects of the skin and soft tissue, developing a need for reconstructive surgery for satisfactory functional and cosmetic results. Therefore, promoted an initial thorough debridement, antibiotic treatment, and cautious metabolic monitoring to control for abnormal parameters.

## Introduction:

Fournier's gangrene (FG) is a kind of necrotizing fasciitis of the perineal, genital and perianal region that has a quickly dynamic and possibly deadly course [1]. Much like various other necrotizing soft tissue infections, the inflammation and edema from the polymicrobial infection bring about an obliterative endarteritis of the subcutaneous arteries [2]. This damaged blood supply advances perifascial dissection with spread of microorganisms and development to gangrene of the overlapping subcutaneous tissue and skin.

Even though FG was initially described by Baurienne in 1764 [3], it is attributed to the French venereologist, Jean Alfred Fournier, that provided a comprehensive summary of the disease in 1883 as a fulminant gangrene of the penis and scrotum [4]. Over the years, experience has revealed that FG typically has an identifiable reason and it regularly shows up indolently. Several terms have been utilized to explain the clinical problem including 'idiopathic gangrene of the scrotum', 'periurethral phlegmon', 'streptococcal scrotal gangrene', 'phagedena' and 'collaborating necrotizing cellulitis' [5].

Topics of both sexes and all ages could be impacted [6]; nevertheless, FG has a proneness for those over the age of 50 with a male to female distribution of 10 to 1 [8]. Early diagnosis remains necessary, as the rate of fascial necrosis has been kept in mind as high as 2- 3 cm per hour. Treatment of FG involves treating sepsis, supporting medical specifications and immediate surgical debridement. Regardless of timely and hostile management, the problem is harmful as most studies report mortality rates of between 20% and 40% with a series of 4- 88% [7].

Remarkably, the death has been shown to be higher in highly sophisticated countries such as the United States, Canada and Europe than in underdeveloped countries [9].

Fournier's gangrene (FG) is a rare but life threatening disease. In this article we discuss the etiology, diagnosis and surgical treatment of Fournier's gangrene and reconstructive surgery after debridement.

### **Methodology:**

A comprehensive search was conducted through major databases; Ovid MEDLINE, Ovid EMBASE, Ovid Cochrane Central Register of Controlled Trials, through November, 2017. The search strategy used Mesh terms; Fournier's gangrene, surgery, management, we also searched references of potentially eligible articles were reviewed to identify all potentially eligible articles. and we limited our search in English language, and human trails only.

### **Discussion:**

- **Aetiology**

At first, FG was specified as an idiopathic entity, but diligent search will reveal the resource of infection in the huge majority of cases, as either perineal and genital skin infections. Anorectal or urogenital and perineal injuries, consisting of pelvic and perineal injury or pelvic treatments, are various other causes of FG (Table 1). One of the most common emphases consist of the gastrointestinal tract (30-50%), complied with by the genitourinary system (20-40%), and cutaneous injuries (20%) [9].

**Table 1.**Etiology of Fournier's gangrene.

<b>Anorectal</b>	<b>Genitourinary</b>
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<p>Trauma Ischiorectal, perirectal, or perianal abscesses, appendicitis, diverticulitis, colonic perforations Perianal fistulotomy, perianal biopsy, rectal biopsy, hemorrhoidectomy, anal fissures excision Steroid enemas for radiation proctitis Rectal cancer</p>	<p>Trauma Urethral strictures with urinary extravasation Urethral catheterization or instrumentation, penile implantsinsertion, prostatic biopsy, vasectomy, hydrocele aspiration,genital piercing, intracavernosal cocaine injection Periurethral infection; chronic urinary tract infections Epididymitis or orchitis Penile artificial implant, foreign body Hemipelvectomy Cancer invasion to external genitalia Septic abortion Bartholin's duct abscess Episiotomy</p>
<p><b>Dermatologic sources</b> Scrotal furuncle Genital toilet (scrotum) Blunt perineal trauma; intramuscular injections, genital piercings Perineal or pelvic surgery/inguinal herniography.</p>	<p><b>Idiopathic</b></p>

Comorbid systemic conditions are being recognized a growing number of in patients with FG, the commonest being diabetics issues mellitus and alcohol abuse; various other associations include extremes old, malignancy, chronic steroid use, cytotoxic medicines, lymphoproliferative conditions, malnutrition, and HIV infection. Diabetic issues mellitus is reported to be existing in 20-70% of patients with FG and chronic alcohol addiction in 25-50% patients [10]. Any type of problem with lowered cellular immunity might predispose to the advancement of Fournier gangrene in theory. The emergence of HIV right into epidemic proportions has opened up a substantial populace in danger for creating FG [11].

- **Clinical Features**

The clinical attributes of Fournier's gangrene consist of unexpected pain in the scrotum, compliance, pallor, and pyrexia. Initially just the scrotum is entailed, however if unchecked, the cellulitis spreads out till the entire scrotal coverings slough, leaving the testes subjected yet healthy [12]. The presentation may likewise be dangerous as opposed to the classic sudden

beginning presentation. One overwhelming feature of the presentation is the strong "repulsive, fetid smell" that is associated with the problem [13] Patients can offer with differing symptoms and signs including fever higher than 38 ° C, scrotal swelling and erythema, purulence or wound discharge, crepitation, or fluctulance [14] In their case collection Ferreira et al. [15] located that one of the most common presentations were scrotal swelling, high temperature, and pain. The mean interval in between preliminary symptoms and arrival at the hospital was  $5.1 \pm 3.1$  days. Scrotal participation was located in 93.3% of cases, the penis was involved in 46.5% of instances, and the perineum or perianal region was involved in 37.2% of cases. Ersay et al. [16] discovered that one of the most common presentation was perianal/scrotal pain (78.6%) adhered to by tachycardia (61.4%), purulent discharge from the perineum (60%), crepitus (54.3%), and fever (41.4%). Crepitus of the inflamed tissue is a common feature of the illness because of the presence of gas developing organisms. As the subcutaneous inflammation worsens, necrotic patches begin appearing over the overlapping skin and development to considerable necrosis [17].The spread of infection is along the facial planes and is generally restricted by the attachment of the Colles' fascia in the perineum. Infection can spread to involve the scrotum, penis, and can spread out up the anterior abdominal wall, up to the clavicle.

- **Imaging Studies of Fournier Gangrene**

### **Conventional Radiography**

At radiography, hyperlucencies standing for soft tissue gas may be seen in the region overlying the scrotum or perineum. Subcutaneous emphysema might be seen prolonging from the scrotum and perineum to the inguinal regions, anterior abdominal wall, and upper legs. Nevertheless, the lack of subcutaneous air in the scrotum or perineum does not exclude the medical diagnosis of

Fournier gangrene. Up to 90% of patients with Fournier gangrene have been reported to have subcutaneous emphysema, to ensure that at least 10% do not show this finding [18]. Radiography could likewise demonstrate substantial swelling of scrotal soft tissue. Deep fascial gas is hardly ever seen at radiography, which represents a substantial weak point of this modality in the medical diagnosis and evaluation of Fournier gangrene [19].

### **Ultrasonography**

A US finding in Fournier gangrene is a thickened wall consisting of hyperechoic foci that demonstrate reverberation artefacts, creating "dirty" shadowing that represents gas within the scrotal wall. Evidence of gas within the scrotal wall might be seen prior to scientific crepitus. Reactive unilateral or bilateral hydroceles might likewise be present. If testicular involvement occurs, there is likely an intraabdominal or retroperitoneal source of infection. US is likewise valuable in differentiating Fournier gangrene from inguinoscrotal put behind bars hernia; in the latter problem, gas is observed in the blocked bowel lumen, far from the scrotal wall [20].

### **Computed Tomography**

The CT features of Fournier gangrene consist of soft-tissue thickening and inflammation. CT could show asymmetric fascial thickening, any existing together fluid collection or abscess, fat stranding around the engaged frameworks, and subcutaneous emphysema secondary to gas-forming bacteria. The underlying reason for the Fournier gangrene, such as a perianal abscess, a fistulous tract, or an intraabdominal or retroperitoneal infectious procedure, may likewise be demonstrated at CT. In early Fournier gangrene, CT could portray progressing soft-tissue infiltration, possibly without evidence of subcutaneous emphysema. Since the infection proceeds

rapidly, the early stage with lack of subcutaneous emphysema is brief and is rarely seen at CT [21].

- **Treatment and Management**

The cornerstones of therapy of Fournier's gangrene are urgent surgical debridement of all necrotic tissue as well as high dosages of broad-spectrum prescription antibiotics. Urgent resuscitation with liquids as well as blood transfusions may be needed and use of albumin and vasopressors in patients who present with shock to boost hemodynamics may be additionally required.

### **Broad Spectrum Antibiotics Coverage**

Empiric broad-spectrum antibiotic treatment ought to be instituted immediately, until the culture results could make adjusted the therapy. The antibiotic routine chosen have to have a high degree of effectiveness against staphylococcal and streptococcal bacteria, gram-negative, coliforms, pseudomonas, bacteroides, and clostridium. Classically Triple therapy is normally suggested. 3rd generation cephalosporins or aminoglycosides, plus penicillin and metronidazole. Clindamycin could be utilized as it is revealed to suppress contaminant production and modulate cytokine production; additionally use of linezolid, daptomycin, and tigecycline is warranted in cases of previous hospitalizations with prolonged antibiotic treatment which might result in resistant bacteroides [22]. New medical standards currently suggest the use of Carbapenems (Imipenem, meropenem, ertapenem) or piperaziline-tazobactam. These newer medicines have bigger circulation and lesser renal poisoning in contrast to aminoglycosides. This brand-new fad recommends that characteristically three-way treatment could be replaced in particular conditions for making use of new generation antibiotics [23].

## **Radical surgical debridement**

In addition to broad-spectrum parental antibiotics, early and hostile medical debridement has been revealed to boost survival in patients presenting with FG as patients typically go through greater than one debridement throughout their a hospital stay [24]. In a retrospective research study of 219 patients providing with a diagnosis of FG, Proud and associates discovered that there was no statistically significant difference in mortality in between patients that undertook debridement prior to transfer or within 24 h of discussion to those that had not. The authors associated this apparently counterproductive monitoring to the array in severity of necrotizing soft tissue infections and to the concept that patients are much less likely to succumb to localized infections. No matter, the authors still support rapid and timely surgical debridement [25].

Considering that the therapy of FG typically needs highly acute and intensive multidisciplinary care, Sorensen and colleagues checked out the distinction in case intensity and management in between mentor and nonteaching medical facilities. Overall, the writers evaluated 1641 situations of FG at an overall of 593 hospitals. It was discovered that more FG instances were dealt with annually at teaching hospitals where a lot more surgical procedures, debridements and helpful care were reported. Surprisingly, patients treated at teaching hospitals had longer size of remain, greater medical facility charges and a greater case death rate second to extra acutely sick patients. After readjusting for patient and hospital elements, it was located that patients dealt with at medical facilities where more individuals with FG were dealt with had 42- 84% lower death compared to medical facilities where only one patient annually was dealt with. This searching for is likely attributable to extra hostile diagnosis and management of FG at skilled health centers. In general, the information in the research study exposed that hospitals where much more patients



with FG are dealt with had lower death rates, supporting the have to regionalize take care of patients with this disease [7].

In a retrospective research of 19 patients detected with FG, Chawla and associates researched the utilization of the FGSI to determine size of stay and survival. In this research, nonsurvivors had a higher FGSI compared with survivors however length of keep was not anticipated by the FGSI. Additionally, it was found that mean number of surgical debridements in survivors was reduced compared to that of nonsurvivors. Moreover, size of stay was not affected by urinary or fecal diversion. Surprisingly, it was observed that patient results were comparable despite management by general surgery or urology solutions [26].

### **Reconstructive surgery**

After extensive debridement, many patients sustain considerable problems of the skin and soft tissue, developing a need for reconstructive surgery for wound protection in addition to acceptable practical and cosmetic outcomes. As a result of these issues, taking place exposure of the testicles in the male patient provides a significant difficulty for reconstruction. The primary objective of reconstruction in patients that have undergone genital skin loss due to necrotizing fasciitis is basic and effective protection. Added goals are good cosmesis and the preservation of penile function, consisting of erection, climaxing and micturition. Insurance coverage needs to be achieved in a manner that restores function promptly with a great cosmetic end result and low linked morbidity and mortality. Salvaging the testes is typically attained by using methods such as thigh pouches, skin grafts and use of fasciocutaneous or musculocutaneous flaps [24].

As mentioned previously, testicular participation in FG is uncommon and suggests an intraabdominal or retroperitoneal resource [9]. Though orchiectomy is seldom called for, it might

be required in situations of substantial tissue damages in the bordering scrotum, groin and perineum causing difficult clothing adjustments [26]. Short-lived thigh pouches to harbor the testicles may be utilized in circumstances when considerable tissue loss could preclude complicated scrotal reconstruction in the acute setting [27]. Chan and collages specify that implantation of the exposed testicle into an adjacent subcutaneous thigh flap can provide a shorter hospital stay and minimize recovery time. Nonetheless, this method is just temporizing, allowing the patient even more time to recover up until clear-cut scrotal reconstruction can be taken on [28]

The best practical and cosmetic outcomes are attained with primary closure of any type of continuing to be scrotum, though this is just possible with little problems. Closure using secondary purpose, especially of large problems, extends healing time yet additionally causes contraction and deformity of the scrotum [29]. In a retrospective research study of 28 man patients offering with FG, Akilov and colleagues assessed the outcomes of very early loosened scrotal approximation and discovered that estimate of the scrotal injury at the time of surgical debridement in patients with as much as 50% involvement could be safely carried out with successful prevention of ipsilateral testis exposure. Loose injury edge closure was attained with a nonabsorbable monofilament suture by U-stitch estimation of the scrotal or perineal wound edges [23].

The advantages of skin grafting are its simplicity of use, adaptability and excellent take. Full-thickness skin grafts (FTSGs) are believed to supply superior aesthetic outcomes. Nonetheless, split-thickness skin grafts (STSGs) are favored over FTSGs for trauma, avulsions, burns and hidradenitis suppurativa due to better take in these contaminated wounds. The study of STSGs in the setup of denuded genitalia has been thoroughly researched and goes back to 1957 when

Campbell initially applied the strategy to the testis after distressing avulsion of the scrotum. Numerous writers have also described the use of STSGs in the setting of FG. Parkash and coworkers defined making use of STSGs to offer additional coverage in 43 cases of FG. Furthermore, after researching numerous different reconstructive methods to offer skin insurance coverage after Fournier's debridement, Gonzales and coworkers promoted the use of STSGs as the treatment of choice for scrotal issues [29].

### **Conclusion:**

Fournier's gangrene is an illness process with a wide variability in presentation. Aggressive surgical debridement remains to be the cornerstone of therapy in Fournier's gangrene, and it could be that those who are destined not to survive, can not tolerate the repeated debridement required for survival. A debridement of the necrotic tissue immediately it is commonly suggested Laor et al. discovered no significant difference in between the beginning time of symptoms, early surgical treatment and death, but various other studies from Kabay et al. and Korkut et al. reveal that this time interval need to be as short as possible. Debridement of deep fascia and muscle is not generally required as these areas are rarely involved similar to testes. After extensive debridement, many patients sustain considerable defects of the skin and soft tissue, developing a need for reconstructive surgery for satisfactory functional and cosmetic results. Therefore, promoted an initial thorough debridement, antibiotic treatment, and cautious metabolic monitoring to control for abnormal parameters.

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