Fournier’s Gangrene, a Urologic and Surgical Emergency: Presentation of a Multi-Institutional Experience with 45 Cases

Dimitrios Koukouras a Panagiotis Kallidonis b Constantinos Panagopoulos a Abhulrahman Al-Aown b Anastasios Athanasopoulos b Christos Rigopoulos b Eleftherios Fokaefs b Jens-Uwe Stolzenburg c Petros Perimenis b Evangelos Liatsikos b

Departments of a Surgery and b Urology, University of Patras, Patras, Greece; c Department of Urology, University of Leipzig, Leipzig, Germany

Key Words
Fournier’s gangrene · Necrotizing fasciitis · Surgical infection · Debridement

Abstract
Objective: To review multi-institutional, multidisciplinary experience in the management of Fournier’s gangrene (FG) in an attempt to identify etiologic parameters as well as to propose methods of efficient management. Patients and Methods: Retrospective chart review of 45 patients diagnosed with FG and treated in three departments (general surgery and urology departments) was performed. Results: Average patient age was 50 ± 15.8 (range 33–81) years. Five female and 40 male patients. Seven patients deceased due to the disease. In 26 and 6 cases, perianal or ischiorectal abscess was present, respectively. These abscesses were extending up to the level of rectovesical/Douglas pouch in 12 cases. Abscesses in the scrotum and perineum were revealed in 10 and 6 cases, respectively. A fistula to the rectum and 8 sinuses to the skin were observed. Colostomy was performed in 25 cases, diverting cystostomy in 17, and orchидectomy in 12 cases. In 18 patients (40%) repeat debridement was deemed necessary. Three patients required more than 3 debridement procedures. Average hospitalization time was 15.7 ± 11.6 (range 4–40) days. Conclusion: FG is a life-threatening form of necrotizing soft tissue infection. The disease is unpredictable and the currently proposed methods for prognosis are promising but still questionable.

Introduction

Fournier’s gangrene (FG) is a fulminant necrotizing infection of the perineal, perianal and periurethral tissues that can disseminate even at the subcutaneous tissue of the thigh or the abdomen following the planes of the dartos fascia of the scrotum and penis, Colle’s fascia and Scarpa’s fascia [1]. It was named after Jean Alfred Fournier, a venereologist, who originally described it in 1883 as an idiopathic, rapidly progressing gangrene of the scrotum occurring in previously healthy young men with no obvious etiologic factors or definite causes [2]. Nevertheless, the disease is no longer considered idiopathic and several causes are known. The majority of the cases occur between 20 and 50 years of age. The male: female ratio is about 10:1 [1, 3].
The mortality of this entity remains high, despite the aggressive treatment modalities (surgical, medical, adjuvant and supportive) that have been incorporated through the years. Anorectal causes present the highest mortality rates. Several surgical reports give a mortality that ranges between 3 and 67% [1, 3–5].

The current study reviews multi-institutional, multidisciplinary experience in the management of FG in 45 cases in attempt to identify etiologic parameters as well as to propose methods of efficient treatment.

**Patients and Methods**

Retrospective chart review of all patients diagnosed with FG and treated in two institutions including three departments (a general surgery and two urology departments) took place. Patients were treated between May 1999 and February 2009. The review of the medical records of those patients included age, gender, etiology, predisposing factors, duration between the onset of symptoms and first debridement, operative time, number of surgical interventions, culture findings, hospitalization time and clinical outcome. A total of 45 patients were identified with FG. The diagnosis of FG depended on the clinical symptoms/signs like erythema, rash, swelling, crepitus and necrosis in the perineal, perianal or genital areas. The general condition of the patients was noted and the diagnostic criteria of sepsis were also included in the diagnostic process. Patients with solitary perianal, periurethral and scrotal abscesses were excluded from the analysis if there was no evident soft tissue extension or necrosis. Tissue cultures were obtained routinely at time of debridement to identify the causative microorganism and to decide the antibiotic therapy. Aminoglycosides or third-generation cephalosporin, metranidazole and penicillin were administered empirically to all patients as combination therapy. If necessary, the antibiotic scheme was modified according to the wound culture results. Abscess drainage and extensive surgical debridement was performed on all patients. Debridement included resection of all necrotic skin, underlying subcutaneous tissue, fascia and muscle to the point that viable tissue was evident. Close monitoring of the patients followed and repeated debridements took place in patients with necrotic tissue, delayed wound healing and clinical worsening (increasing leukocytosis, renal dysfunction, etc.). Cystostomy was performed in cases of significant urethral or penile pathology. Colostomy took place when severe fecal contamination or gangrene extending to the anal sphincter was present. Wet to dry or negative pressure dressing was routinely applied on the site of the wounds. Hyperbaric oxygen therapy or the use of unprocessed honey for wound dressing never took place in any of the patients [6]. Plain abdominal and pelvic X-ray, abdominal ultrasonography (US) and computed tomography were performed selectively in cases of clinical worsening in an attempt to identify the extent of the disease process postoperatively. Mortality was defined as disease-related death during hospitalization.

Statistical analysis was performed for the identification of significant differences between patients who survived and patients who deceased by FG. We used Mann-Whitney test to compare the numerical variables. The statistical significance was defined as p < 0.05.

**Results**

Mean patient age in the current series was 50 ± 15.8 (range 33–81) years. Five female and 40 male patients were included. The perioperative data of the current patient series are included in table 1. Disease-related death during hospital stay was identified in 7 patients (15.6%). The operative management took place in the first 24 h after admission, usually within 6 h. In 26 and 6 cases, perianal or ischiorectal abscess was present respectively. These abscesses were extending up to the level of rectovesical/Douglas pouch in 12 cases. Abscess in the scrotum and perineum were revealed in 10 and 6 cases, respectively. Penile involvement was present in 23 cases. It should be noted that several patients had more than one abscesses usually located in neighboring areas. Cultures of the drainage fluid or peritoneal fluid were performed in all cases. The results of the cultures in the current population are presented in table 2. Twenty patients underwent second debridement procedure (44.4%). Three patients required more than 3 debridement procedures: 1 case required 4 and the remaining patients (n = 2) 3 debridement procedures (6.7%). In 12 patients extensive involvement of the fascias extending to the lower thighs to the level of the knee or to the posterior of the body to the level of the lumbar vertebrae as well as anterior and lateral abdominal wall to the level of the thorax was present (fig. 1, 2).

Wounds were treated with wet to dry gauze dressings and/or negative pressure dressings in all cases. Wound closure took place when viable healthy tissue was present and allowed re-approximation either immediately after the procedure or during the following days.

**Discussion**

Every patient admitted with scrotal cellulitis must be considered a potential urological emergency, since FG represents one of the most challenging diseases in urology. Nevertheless, most of the scrotal cellulitis cases will prove to be minor and they will only require oral or intravenous antibiotic treatment.

Diabetes mellitus (present in 32–66% of all cases of FG), chronic ethanol abuse (reported in 20–60% of patients), steroid therapy, hematologic or other malignancy, chemotherapy and HIV infection, paralysis or neurologic deficit are conditions that predispose to the development of FG. Most of these conditions are related to impaired microcirculation and to immunosuppression [3, 7–11].
The basic pathological mechanism of the disease process is believed to be an obliterative end arteritis caused by the spread of the pathogens, on the ground of distal arterial disease and immunocompromise (i.e. diabetes mellitus) that most commonly pre-exists in the patients [3, 7, 12–14].

The source of the infecting organisms in FG is most commonly the periurethral glands. Other portals of microbial entry have been reported to be scrotal abscesses, urethral strictures, perirectal abscesses, ruptured appendices, colonic carcinoma, diverticulitis and dermatological conditions, the latter being more common in the developing world [3, 15, 16]. Other, less common portals include hernia repair, hemorrhoidal banding, urethral catheterization, neonatal circumcision, prostatic biopsy [3], vasectomy operations [17, 18] and tension-free vaginal tape procedure [19]. Even local trauma from coitus has been described as a potential reason for microbial entry [1]. A wide variety of pathogens has been reported to be responsible for the infection, such as streptococcal and staphylococcal strains, *Bacteroides* species, *Enterococcus*, *Escherichia coli* and other bacterial species as well as fungi [3, 9]. The highest rates of isolation in diabetic patients have been reported to be *Streptococcus* spp. and *Staphylococcus* spp., and also mixed anaerobic flora [9, 20]. The currently presented pathogens are similar to the above reported.

Local discomfort, scrotal pain, redness, edema and crepitus due to subcutaneous emphysema which may extend up to the axillae, thighs and perianal tissues, implies that there are anaerobic conditions in the area [14, 15, 21]. Fever, malaise, leukocytosis, anemia and electrolyte abnormalities can also be present. The testes and spermatic cords are spared from the infection due to their independent blood supply, but in up to 21% of patients there will
be a need for orchidectomy of the affected side because the testis will become nonviable [7].

Prompt recognition of the infection and its aggressiveness is essential for the final outcome regardless of the final treatment method. The diagnosis is primarily clinical, despite the inclusion of several imaging modalities like scrotal ultrasonography, CT scan or MRI.

There is an ongoing debate in the literature regarding the impact of the time period between disease onset and treatment initiation. Some investigators have observed that the survivors have a shorter period than the non-survivors while others do not find any difference [6]. We did not observe any difference in our population.

The management of the infection must be aggressive, with adequate fluid resuscitation and hemodynamic support, mostly in the intensive care setting. Empirical broad-spectrum antibiotic therapy (penicillin, metronidazole and third generation cephalosporin with gentamicin are appropriate) is essential [1]. One must always keep in mind that antibiotic therapy may cause a possible fungal infection to get out of control. Wide (and often repeated, due to the dynamic nature of fasciitis) excision of the necrotic tissue is important. Urinary diversion (in the form of suprapubic cystostomy) is recommended in all patients by some authors [22], whilst others suggest that it should be reserved for patients with extensive urethral involvement [23]. We favored the urinary diversion in patients with significant urethral or penile pathology. In the latter cases, the diversion served the same way that the colostomy serves in the population of FG. The urinary diversion allows the sites of urethral or penile pathology to heal without the influence of urine on them.

Surgical wounds are left open. Irrigation with hydrogen peroxide can be incorporated as an adjuvant therapy, providing both mechanical cleaning of the wound and destruction of anaerobic organisms often associated with the infection. Proper wound dressing exchange and constant wound condition evaluation is mandatory. Surgical debridement should be performed promptly when there are signs of infection progression and/or necrosis on wounds. Reconstructive surgery should be performed after the successful management of the disease and may require the contribution of plastic surgeons. Extensive debridement was deemed necessary during our experience and led to reconstruction up to the level of thorax (fig. 1).

The use of hyperbaric oxygen therapy has been reported and evaluated by several authors. However, the efficiency of the method in the treatment of FG remains questionable [6]. The contribution of unprocessed honey dressings for the postoperative management of debridement wounds after the surgical treatment of FG remains unclear. We did not use the above proposed methods such as unprocessed honey since their use has not been documented adequately in FG management as well as in other etiology wound management cases [6].

The currently presented population of patients did not have any difference regarding demographic parameters such patients age, gender and patient co-morbidities in
comparison to other presented series. The mortality rate compares favorably to recently presented series. Only 7 patients (15.6%) deceased in our series in comparison to 7.5–40% mortality in recently presented series [3, 6, 24]. A significant proportion of our patients (n = 32, 71.1%) had perianal- or perirectal-related pathology and perfor- 
ence of colostomy was not uncommon in these cases. FG developing from the above sites is frequently reported in the literature [3]. These abscesses were extending up to the level of rectovesical/Douglas pouch without involving the peritoneal cavity. The presence of 10 scrotal abscesses represents a significant portion of the current population. The cause of these abscesses could be attributed to periurethral gland infections, perianal and perineal infection extension. The management of these cases usually requires the performance of orchidectomy when the viability of the testis is compromised or there is significant damage to the surrounding tissue [25].

A fistula between the abscess cavity (n = 1, 2%) and rectum and sinuses to the skin were observed (n = 8, 17.7%). These cases require excision of the fistula or sinus during the debridement and the performance of colostomy in cases of rectal fistulas contributed to the further management. We performed endoscopic investigation (colonoscopy) in an attempt to elucidate the communication of bowel with the abscess cavity. The absence of communication was a significant negative factor for the decision to perform a colostomy. Since the latter procedure has significant complications and requires additional surgical care after the successful treatment of FG, the option of avoiding a colostomy was interesting. Nevertheless, colostomies were performed in 55.5% of the current cases as the perianal and perirectal abscesses were associated with bowel involvement. Further evaluation would document the usefulness of the endoscopic investigation in FG cases.

The prognosis of the gangrene is an important issue considering the mortality rates. A Fournier’s gangrene severity index score (FGSI) has been proposed to predict the outcome. A score greater than 9 is suggested to have a 75% probability of death and an index score 9 or less is associated with 78% of survival. Nevertheless, the accuracy of the method remains controversial [6, 26–28]. Although recent evidence confirms the prognostic value of FGSI, others suggest that the system could not be used in clinical practice to predict survival of the patients. Prognostic assessment is useful but the lethal nature of FG leads the clinician to intensify his efforts to management of the disease by intensive patient care and surgical management. Thus, we do not favor the FGSI as a method crucial for the management of these patients. Nevertheless, the lack of FGSI is a limitation of this study which is also related to the retrospective nature of the current investigation.

Conclusion

FG is a rare but a life-threatening form of necrotizing soft tissue infection. It is mainly diagnosed clinically. A multidisciplinary approach should always be considered for the efficient management of the clinical condition. Extensive use of antibiotics, intensive wound care and aggressive surgical debridement is necessary. The disease is unpredictable and the currently proposed methods for prognosis are promising but still questionable.

References

4 Basoglu M, Oz bey I, Atamanalp SS, Yildir- 
37:558–563.
6 Kabay S, Yucel M, Yaylak F, Algin MC, Har- 
7 Hejase MJ, Simonin JE, Bihrle R, Coogan 
8 Smith GL, Bunker CB, Dinneen MD: Fourn- 
9 Nisbet AA, Thompson JM: Impact of dia- 
betes mellitus on the presentation and outcomes of Fournier’s gangrene. Urology 2002; 60:775–779.
10 Yanar H, Toviloglou K, Ertekin C, et al: 
12 Rajbhandari SM, Wilson RM: Unusual in- 
13 Jones RB, Hirschmen JV, Brown GS, Tre- 