

# Management of Fournier's Gangrene in a Low Resource Setting

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## ABSTRACT

**Background:** Fournier's gangrene (FG) represents a necrotizing infection of the skin and subcutaneous soft tissue of the external genitalia and perineum. Although the condition is rare in absolute terms, over 1726 cases have been reported in English literature, with a male/female ratio of 10:1. There have been 502 cases from Africa, which ranks second to the USA/Canada. At present, there is only one published literature on the management of FG in Liberia. **Objective:** This study highlights the late presentation and the challenges in the management of FG at the John F. Kennedy Medical Center. **Methodology:** This is a retrospective study of 30 patients with FG who were admitted and managed by our division of urology, from January 2018 to May 2019. The patient's records were retrieved and reviewed for age, sex, onset of disease, sites of the disease, management, duration of stay, and outcome. The frequency and percentage of various parameters were displayed in tables. **Results:** All the patients were male with a mean age of 44.3 years + 15.6 (range of 20–75 years). The peak incidence was between 30 and 39 years. Majority of the patients were farmers (26.6%), petty traders (20%), and commercial drivers (20%). The site of gangrene was scrotal (53.3%), penile (16.7%), perineal (3.3%), and more than one site (26.7%). Most of the patients (46.7%) presented within 3–7 days, from onset of symptoms followed by 30% after 2 weeks. The mean hemoglobin was 11.6 g/dl (range of 8.3–15 g/dl). All the patients underwent debridement and were treated with intravenous antibiotics, intravenous fluid, and daily wound care. The most common method of wound closure was secondary closure (80%), 20% had skin graft, and none had flaps. Unilateral testicular loss was 10%. The mean length of hospital stay was 53 days (range of 8–63 days). About 60% of patients were discharged home without disability, 20% had to leave with either suprapubic catheter or colostomy to return for further management. Mortality was about 20%. **Conclusion:** The diagnosis of FG is clinical. The presentation is delayed in our setting; therefore, extensive debridement and antibiotic administration are essential for infection control. Wounds are usually extensive and will require skin graft for closure. Early intervention by clinicians is necessary to reduce morbidity and mortality.

**Key words:** Debridement, Fournier's Gangrene, Penis, Perineum, Scrotum, Skin graft

## BACKGROUND

Fournier's gangrene (FG) represents a necrotizing infection of the skin and subcutaneous soft tissue of the external genitalia and perineum.<sup>[1,2]</sup> In 1764, Baurienne first described this condition, but in 1883, Jean Alfred Fournier defined it as an idiopathic, rapidly fulminating infection in previously healthy

young patients and pointed out the known predisposing factors for the development of this type of gangrene.<sup>[1-5]</sup> Mortality ranges from 0 to 67% in some series (FG 5-7).

Necrotizing fasciitis in the region of the perineum and genitalia should be termed FG, regardless of the etiology or the presence of infection because the prognosis and treatment are the same.<sup>[6]</sup>

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Although the condition is rare in absolute terms, over 1726 cases have been reported in English literature, with a male/female ratio of 10:1.<sup>[2,7]</sup> There have been 502 cases from Africa, which ranks second to the USA/Canada.<sup>[2]</sup>

It is most frequently seen in men in their third and sixth decades of life, with the mean age of patients above 50 years.<sup>[2]</sup> Diabetes mellitus, hypertension, immunosuppression, alcoholism, chronic renal failure, obesity, cortisone use, malignancy, pulmonary diseases, and systemic disorders are known to be the predisposing factors for FG.<sup>[8,9]</sup> Others include urethral obstruction, instrumentation, urinary extravasation and trauma, morbid obesity, and poor hygiene.<sup>[7,10,11]</sup> Treatment is costly due to long duration of hospital stay, serial debridement, and antibiotics usually third-generation cephalosporins, aminoglycosides, and metronidazole,<sup>[5]</sup> while others may use relatively more expensive antibiotics such as meropenem and vancomycin.<sup>[12]</sup> In up to 77% of cases, urinary diversion by suprapubic cystostomy is required.

This study highlights the late presentation and the challenges in the management of FG at the John F. Kennedy Medical Center, a resource-limited referral center in Liberia.

## METHODOLOGY

This is a retrospective descriptive study. The subjects included patients who were admitted from January 2018 to May 2019 at the John F. Kennedy Medical Center in Monrovia, Liberia. The patient's records were retrieved and reviewed for age, sex, onset of disease, sites of the disease, management, duration of stay, and outcome. All the cases were attended by the urology team of the department of surgery. The diagnosis of FG was made on clinical grounds after a detailed history and physical examination. Baseline evaluation consisted of packed cell volume, full blood count, serum electrolytes, urea and creatinine, and fasting or random blood sugar estimation. Routine testing for HIV was done for all patients. The facility lacked computed tomography scan, standardized intensive care unit, and microbiology for culture and sensitivity during the study period. In the absence of a plastic surgeon for skin graft, all those requiring skin graft were comanaged with a general surgeon. The data obtained were analyzed using SPSS version 16.

## RESULTS

All the patients in the study were male with the mean age of 44.3 years  $\pm$  15.6 (range of 20–75 years). The peak incidence was between 30 and 39 years. Majority of the patients were farmers (26.6%), petty traders (20%), and commercial drivers (20%) [Table 1]. Almost all the patients presented with scrotal swelling and scrotal pain. The site of gangrene was scrotal (53.3%), penile

**Table 1:** The biodata of the patients, sites involved in the gangrene, and blood transfusion

Age range	Frequency	Percentage
20–29	4	13.3
30–39	10	33.3
40–49	2	6.7
50–59	6	20.0
60–69	6	20.0
70–79	2	6.7
Total	30	100
Occupations of the patient		
Driver	6	20.0
Petty trader	6	20.0
Pensioner	4	13.3
Farmers	8	26.6
Civil servant	2	6.7
Students	2	6.7
Unemployed	2	6.7
Total	30	100
Sites of gangrene		
Scrotal	16	53.3
Penile	5	16.7
Perineal	1	3.3
More than one site	8	26.7
Total	30	100
Blood transfusion		
Transfused	22	73.3
Not transfused	8	26.7
Total	30	100

(16.7%), perineal (3.3%), and more than one site (26.7%). Predisposing factors identified included: Poor personal hygiene in about (50%) of cases, bladder outlet obstruction (13.3%), diabetes (20%), stroke (6.7%), and post-surgical complication (10%). Comorbidities included hypertension (6.7%), sickle cell diseases (13.3%), and HIV (6.7%) and 73.3% without comorbidity [Table 2].

Most of the patients (46.7%) presented within 3–7 days, from onset of symptoms followed by 30% after 2 weeks. Few presented in <72 h of onset of symptoms. Most patients (80%) received some form of treatment before arrival, 16 (53.3%) patients were treated with unspecified antibiotics, 8 (26.7%) patients were treated with herbs, and only 6 (20%) had no pre-hospital treatment. The mean hemoglobin on arrival was 11.6 g/dl (range of 8.3–15 g/dl). Up to 73.3% had blood transfused. None of the patients had culture and sensitivity available but all recorded marked leukocytosis with a left shift

[Table 2]. The most common method of wound closure was secondary closure (80%), 20% had skin graft, and none had flaps. Unilateral testicular loss was 10%. The mean length of hospital stay was 53 days (range of 8–63 days). About 23.3% stayed for <4 weeks, 56.7% for 4–6 weeks, and 20% for more than 6 weeks. While 60% of patients were discharged home without disability, 20% had to leave with either suprapubic catheter or colostomy to return for further management. Mortality was about 20% in the series.

## DISCUSSION

FG is uncommon but not rare.<sup>[13]</sup> However, it remains a rare disease in women, with a male/female ratio of 10:1.<sup>[14]</sup> The incidence may be lower in female due to the better attempts toward perineal hygiene as opposed to their male counterparts. In our study, all the patients (100%) were male with low socioeconomic status and hygiene being pertinent predisposing factors. Dos-Santos *et al.* described relatively higher prevalence in female, where he documented up to 27.5% of his subjects to be female,<sup>[15]</sup> although no reasons were advanced for such findings.

A retrospective study done in Brazil involving 40 patients with FG showed a mean age of  $51.7 \pm 16.3$  years,<sup>[16]</sup> with males' highest prevalence in the third to sixth decades. These findings are concurrent with our research that revealed the median age of  $44.3 \pm 15.6$ . Although the study did not give a breakdown of these three decades, we found the age group of 30–39 to have the highest prevalence of 33.3% and closer to what Chalya *et al.*<sup>[16]</sup> reported in Korea, of having 58.3% among the fourth decade. The relatively younger peak age range in our study had different etiology other than urinary tract obstruction and diabetes which are relatively rare in this age group. Fajdic *et al.* similarly reported a median age of 42 years in their review, which is closer to our findings as well.<sup>[17]</sup>

The median time from onset of symptoms to the presentation of patients to the John F. Kennedy Medical Center was 7 days. Almost 70% of men in the study presented after 3 days with 30% presenting up to 2 weeks after onset of symptoms. This delay contributed to extended hospital stays and highlighted the need for protocols to be in place to assess and treat patients presenting with FG. When these patients finally seek medical attention, many are in critical condition<sup>[18]</sup> and late presentation of more than 48 h has been a positive predictor of mortality.<sup>[16]</sup>

According to Fajdic *et al.*, 2007, the duration of symptoms before admission was ranging from 3 to 9 days (5.4 on average) almost similar to our findings.<sup>[17]</sup> With such delays, it would be imperative to know, thus, early involvement with necessary specialties is an important early step in the treatment plan following hemodynamic stabilization of the

**Table 2:** The distribution of predisposing factors, comorbidity, intervals between appearance of symptoms and presentation to our health facility and intervention, pre-hospital treatment, duration of hospital stay, wound closure, and management outcome

Predisposing factor	Frequency	Percentage
Poor hygiene	15	50.0
Bladder outlet obstruction	4	13.3
Diabetes mellitus	6	20.0
Stroke	2	6.7
Post-surgical	3	10.0
Total	30	100
Comorbidity		
None	22	73.3
Hypertension	2	6.7
Sickle cell disease	4	13.3
HIV	2	6.7
Total	30	100
Disease and presentation interval in days		
1	2	6.6
2	5	16.7
3–7	14	46.7
>7	9	30.0
Total	30	100
Pre-hospital treatment		
None	6	20.0
Antibiotics	16	53.3
Herbs	8	26.7
Total	30	100
Wound closure		
Delayed primary	24	80.0
Skin graft	6	20.0
Total	30	100
Duration of hospital stay in weeks		
<4	7	23.3
4–6	17	56.7
>6	6	20.0
Total	30	100
Outcome of treatment		
Discharged home	18	60.0
Discharge with disability (suprapubic catheter colostomy)	6	20.0
Died	6	20.0
Total	30	100

patient and administration of broad-spectrum antibiotics.<sup>[18]</sup> Significant number of the patients had intervention with either unspecified antibiotics or traditional medication, making them to delay and only present when the infection is overwhelming.

A study done by Irekpita *et al.* highlighted that most patients with FG were either low ranking police personnel, artisans, or retired civil servants.<sup>[19]</sup> Retrospective review of nine patients at the John F. Kennedy Medical Center by Gbozee *et al.* showed that all the patients in the review were of low socioeconomic status.<sup>[20]</sup> These findings are consistent with our study, in which most patients were peasant farmers, petty traders, or commercial taxi drivers. The fact that low socioeconomic status and poor hygiene are related supported our findings.

Gbozee *et al.* reported the sites of gangrene was scrotal in 77% of patients, peno-scrotal in 11% and abdomino-scrotal in 11%.<sup>[20]</sup> In our study, the gangrene was limited to the scrotum in 53.3% [Figures 2a-c], penile 16.7%, [Figure 1a,b] perineal 3.3% [Figure 3a-c], and more than one site including extension to anterior abdominal wall in 26.7% as shown in [Figure 4a-c]. Equally, Chalya reported similar distribution as 78.6% scrotal, 4.8% perineal and 4.8% perianal.<sup>[16]</sup> This could be explained by delayed presentation, extent of the disease and probable delay in intervention leading to extension of the necrosis.

Factors arising in the perianal and perineal regions are often reported as the most common causes of this ailment.<sup>[1,21]</sup> At present, studies are postulating that repeated itching and scratching of the scrotum over a mean of 26 days may cause microtrauma with subsequent infection which remains unidentifiable due to the ensuing gangrene.<sup>[22]</sup> The microtrauma can equally lead to thrombosis of feeding arteries, leading to gangrene.<sup>[23]</sup> This association is now being considered as a common cause of FG but usually compounded by other risk factors as poor hygiene.<sup>[24]</sup> We found poor hygiene to be the single most important risk factor in up to 50% of our patients more than bladder outlet obstruction. This may explain why the relatively younger age group of 30–39 had the highest

incidence as opposed to middle age and the elderly whose risk factors are more of bladder outlet obstruction.

A study done by Aghaji *et al.*<sup>[25]</sup> in Nigeria displayed urethral stricture as predisposing etiological factor in 30%, chronic scrotal itching 26%, urethral catheterization 15%, post-scrotal surgery 12%, fissure-in-ano 8%, ischiorectal abscess post-drainage 4%, and urethral stone 2%. In our study, urethral stricture was a predisposing factor in only 13.3% and a post-surgical in 10%, which is close to these findings.

There were no comorbidities documented in up to 73.3%, while hypertension (6.7%), sickle cell diseases (13.3%), and HIV (6.7%) were among the few recorded [Table 2]. Findings from this study showed that HIV infection was only found in a few despite screening all, which suggested competent immune system in most patients with delayed presentation, extensive gangrene and sepsis on empirical antibiotics, and relatively lower mortality when compared with other studies. Although Chalya *et al.* reported high prevalence of HIV in his study (33.3%),<sup>[16]</sup> Ngugi *et al.*<sup>[26]</sup> reported lower prevalence of HIV as either comorbidity 16.4% or predisposing factor 1.4%, with a mortality of 20.5% mainly due to overwhelming sepsis and renal failure.

All the patients underwent debridement and were treated with intravenous antibiotics, intravenous fluid, and daily wound care. The antibiotics were strictly ceftriaxone and metronidazole. Facilities for microscopy, culture, and sensitivity were not accessible; therefore, antibiotics were administered empirically and clinically. Ngugi *et al.* reported the use of metronidazole in 81.5% and ceftriaxone in 21%. Other studies included crystalline penicillin, Augmentin and Ampiclox, and gentamicin.<sup>[26]</sup> Additional antibiotics were not used in our series and wound closure was achieved in more than 80%. Lack of culture and additional antibiotics might have contributed to the longer duration of hospital stay or the mortality, as all patients with leukocytosis. This was equally documented by Chernyadyev *et al.*,<sup>[23]</sup> having all with leukocytosis and shift to the young forms. Aggressive debridement and appropriate antibiotics mitigate mortality and morbidity.<sup>[27]</sup> Mortality among patients who declined



**Figure 1:** (a) A penile Fournier's gangrene (FG) that requires a suprapubic urinary diversion. (b) A debrided penile FG with an associated urethrotomy



consent for debridement was 100% in some series;<sup>[15]</sup> none of our patient declined intervention.

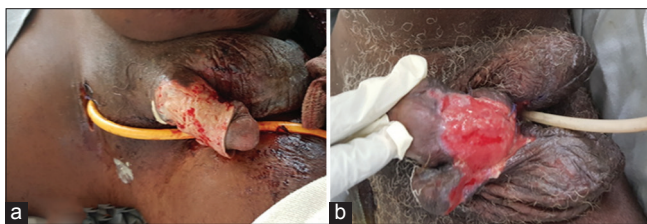
All patients underwent at least one debridement, ranging from 1 to 5 in extreme of cases. Multiple debridements have been offered by almost all authors.<sup>[16]</sup> Nevertheless, no negative pressure wound therapy was available to be offered.

The most common method of wound closure was secondary closure (80%), 20% had skin graft, and none had flaps. Similar pattern was reported by Chalya *et al.*, who had 77.4% for secondary closure and 16.7% skin graft. Mello and Helene Júnior<sup>[28]</sup> described scrotal skin loss as an indicator for skin graft. Some authors described much more complex flaps in extensive skin loss and suggested

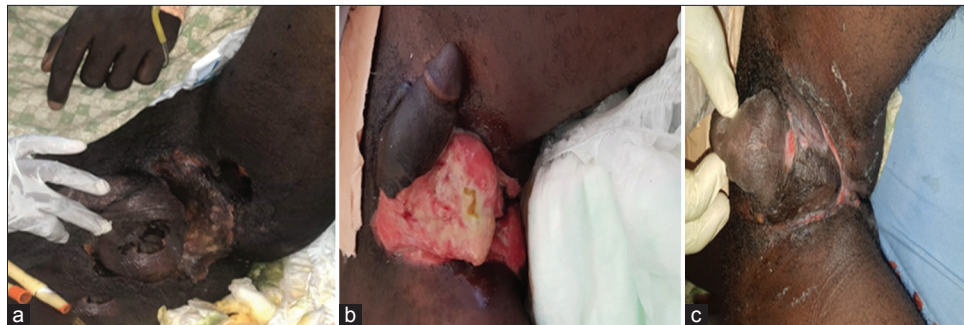
transposition of testes to the subcutaneous tissues of the upper thigh, but associated with pain, atrophy, and decreased or impaired spermatogenesis due to heat from the abdominal wall. Various flaps such as transposition fasciocutaneous flaps with posterior-inferior basis, gracilis myocutaneous in V-Y advancement or gracilis, and rectus abdominis flaps are being used in much extensive tissue loss.<sup>[28]</sup> None of our patients had flaps due to multiple factors including delay in wound closure with subsequent wound contraction and lack of plastic surgeon/expertise.

Unilateral testicular loss was found in 10% due to prolonged exposure, desiccation, or extensive necrosis; other studies reported as low as 3.6%<sup>[27]</sup> and as high as 15.3%.<sup>[15]</sup>

Although findings from several studies have shown that due to the relatively delayed presentation, most patients will need extensive debridement repeated daily with combined antibiotic therapy using several antibiotics, due to mixed infection.<sup>[17]</sup> We attributed the delay in our study due to pre-hospital therapies, these patients might have taken which may have delayed the disease progression for a while before becoming overwhelming or realizing the need to go to a hospital. This is to emphasize that most patients (80%) received some form of treatment before arrival: 16 (53.3%) patients were treated with unspecified antibiotics, 8 (26.7%) patients were treated with herbs, and only 6 (20%) had no pre-hospital treatment.



**Figure 2:** (a) Fournier's gangrene with total scrotal skin necrosis. (b) Gangrene affecting the scrotum. (c) Primary closure, as shown above, was successful in some patients for wound closure



**Figure 3:** (a) Fournier gangrene involving the scrotum and perineum. (b) Granulation tissue along the scrotum and perineum after extensive debridement and awaiting colostomy reversal after a diverting colostomy. (c) Split-thickness skin graft achieved satisfactory wound coverage after 99% take



**Figure 4:** (a) Extensive Fournier's gangrene with massive necrosis of the scrotal and perineal skin. (b) A penoscrotal gangrene with extension to the lower abdominal wall. A suprapubic catheter was inserted for urinary diversion. (c) Healthy granulation tissue appeared 4 weeks after extensive and repeated wound debridement

The mean hemoglobin on arrival was 11.6 g/dl (range of 8.3–15 g/dl). Up to 73.3% had blood transfused. Anemia is a common presentation in patients with FG and one of the predictors of mortality. Chalya *et al.* reported a mortality rate of 95.2% in those with Hb <10 g/dl,<sup>[16]</sup> while Park *et al.*<sup>[29]</sup> described Hb of  $11.3 \pm 1.4$  g/dl as a predictor of mortality as against  $17.7 \pm 2.3$  g/dL for survival. Despite all these predictions, all authors remained silent about the cause of the anemia, indication of blood transfusion, and whether it was given to improve the anemia or not. In our study, up to 73.3% had transfusion, and we attributed the anemia with the disease processes, undernutrition, and losses during surgical debridement and daily change of dressings.

No patient had culture and sensitivity available but all recorded marked leukocytosis with shift to young forms. These made all the cases in our study received ceftriaxone and metronidazole during their management with repeated blood transfusion and concurrent and serial debridement leaving extensive wounds later closed by skin graft or secondary closure. El-Sabbagh<sup>[30]</sup> described primary skin closures as found in this series. Other forms of wound closure including flaps were also reported in that review<sup>[30]</sup> which wasn't performed in our center due to lack of expertise by the urology team and lack of plastic surgeon. Wang *et al.*<sup>[31]</sup> described the use of vacuum sealing device and femoral posterior neurocutaneous perforator flaps preserving the blood supply and sensation in the treatment of perineal gangrene, none was used in our study.

A diverting colostomy was performed in 3/30 (10%) of patients due to extensive perineal involvement with one case involving the sphincter, and 3/30 patients required suprapubic urinary diversion as well. Although there is no consensus, we found both the fecal and urinary diversion very helpful in the management of these patients just as reported by other authors.<sup>[32]</sup> Ferretti *et al.*<sup>[18]</sup> documented 25% of patients having urinary diversion and ostomy in a series of 29 patients, which is higher than 10% each in our study. Mello and Helene Júnior<sup>[28]</sup> reported 33.3% ostomies in his study and concluded that it has a survival rate advantage. However, some studies reported no demonstrable advantage.<sup>[16]</sup>

The mean length of hospital stay was 53 days (range of 8–63 days). About 23.3% stayed for <4 weeks, 56.7% for 4–6 weeks, and 20% for more than 6 weeks. The average duration of hospital stay in most literature is about 37 days including Ayan *et al.*<sup>[21]</sup> and Safioleas *et al.*<sup>[33]</sup> Nevertheless, there was a much longer length of hospital stay in this study averaging 53 days. The longer hospital stay could have either been due to delayed decisions for wound closure by the surgical team to as microscopy, culture and sensitivity were available in our Center to ascertain wound cleanliness. The decision for wound closure relied heavily on the appearance of healthy granulation tissue after serial debridement. Park *et al.*<sup>[29]</sup> reported an average duration of hospital stay to be

49 days and related it to delayed presentation and delayed in the first debridement. Those who had very late or no debridement at all could not survive the disease even with a relative longer hospital stay.

Despite our various limitation, 60% of the patients were discharged home in good conditions while about 6/30 (20%) with some disability, half of which 3/30 (10%) on suprapubic cystostomy [Figures 2a, 4b, 4c] due to yet to be addressed urethral stricture and the other half on colostomy waiting for complete healing of perineal wound before colostomy takedown [Figure 3b and c] or lost testis which was recorded in 10% of our patient. This is much lower than what is reported in some studies, in which the need of SPC was in up to 77% of patients and unilateral orchidectomy due to necrotic or exposed and desiccated testis was 15.5%.<sup>[11]</sup>

The lack of microbiological study, delayed presentation and probable pre-hospital ingestion of unspecified antibiotics, and unknown herbs in up to 80% of the patients might have contributed to the mortality in some series. However, the relatively lower mortality of 20% could have been attributed to the immediate introduction of broad-spectrum antibiotics and extensive first debridement reducing septicemia despite perineal involvement in up to about 30% of the patients. Some studies have documented mortality excluding perineal involvement to be about 25% but rises to 45% when perineum is involved.<sup>[5]</sup> In other literature, mortality ranges from 0–67%<sup>[2]</sup> to 3–60%.<sup>[34]</sup> In one study, perineal involvement specific mortality was documented at 50% as against 20% general mortality in the same study.<sup>[30]</sup>

### Limitation

This is a retrospective study that could be affected by selection bias. Full access to patient's data including etiologies and risk factors for FG was not available for all patients. Theoretically, the study population sized is underpowered, but the disease is uncommon, and review of literature does not project much greater study population.

## CONCLUSION

The diagnosis of FG is clinical and a surgical emergency that develops acutely and progresses rapidly. It is associated with pronounced morbidity and mortality rates. Despite delayed presentation (although usually on unspecified antibiotics), we found that effective resuscitation, aggressive surgical debridement, and empirical broad antibiotics administration in the absence of culture and controlled wound care can reduce morbidity and mortality rates.

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## AUTHORS' CONTRIBUTIONS

Conceptual design: BY, AKC, and SK. Analysis, drafting, and critical revision of the article: BY, AKC, AC, and SK. Final approval of the article: BY, AKC, AC, SK, and EI.

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