Original Article

Pattern and outcome of management of Fournier's gangrene in a resource-constraint setting

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Abstract

Introduction: Fournier's gangrene (FG) is a necrotizing fasciitis of the external genitalia and perineum but may involve upper thigh and anterior abdominal wall.

Patients and Methods: This is a retrospective study of 47 patients managed for FG at Usmanu Danfodiyo University Teaching Hospital from January 2001 to June 2017. Data were entered into a semi-structured pro forma and analyzed using SPSS version 20.0.

Results: The mean age of the patients was 42.7 ± 19.4 years, with age range of 7 weeks to 72 years. All the patients were male. The patients had underlying urologic conditions in 27.6%, 15.0% were postoperative, 4.2% had anorectal diseases, 10.6% had medical conditions, and 42.6% were idiopathic. After resuscitation, all the patients had serial debridement, Hypertonic saline bath, broad spectrum antibiotics and wound dressing. The wound healed by secondary intention in 34.0% and 32.3% of the patients had wound closure ± skin graft. The treatment was successful in 68.0% of the patients, 15.0% left against medical advice, and 17.0% died of severe sepsis.

Conclusion: FG mainly affects men with existing urologic conditions in our environment. Aggressive debridement, hypertonic saline sitz bath, broad-spectrum antibiotics, and appropriate wound care are associated with good outcome.

Keywords: Fournier's gangrene, Fournier's Gangrene Severity Index, mortality, necrotizing fasciitis, predisposing factors, Uludag Fournier's Gangrene Severity Index

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INTRODUCTION

Fournier's gangrene (FG) is usually an acute rapidly progressive and potentially fatal form of necrotizing fasciitis of the external genitalia and perineum, but it may, at times, involve the thigh and abdominal wall.[1] In its initial description, this syndrome was presumed to be of idiopathic etiology, as it was reported to occur in apparently healthy young adult males.[2] Although commonly described in adult males, FG has been reported in the neonates, early childhood as well as in the females.[3-5]

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In the past two decades, increasing understanding of the etiopathogenesis of the disease have demonstrated that it is an infective process as there is usually a finding of the source or focus of infection in a majority of the patients ranging from the perineal and genital skin foci as a consequence of at times trivial urogenital, perineal anorectal trauma.[6] The underlying medical conditions in patients with FG include human immunodeficiency infection, diabetes mellitus, chronic alcoholism, and malignancy.[7-11] These conditions provide a favorable environment for infection as a result decreased host immunity, thus allowing a portal of entry and proliferation of inoculated microorganisms. Pathogenesis of FG is a result of the synergetic activities of multiple bacteria of low virulence that reside in the perineum which include aerobes and anaerobes.[8] Multiplication of the bacteria results in elaboration of various exotoxins and enzymes such as collagenase, heparinize, hyaluronidase, streptokinase, and streptodornase which promote further multiplication and spread of the infection.[9] The aerobic bacteria cause platelet aggregation and induce complement and the resultant coagulation.[10,11] The anaerobic bacteria promote formation of clots by producing collagenase and heparinize.[12] The infection spreads along fascial planes with initial involvement of the superficial fascia and deep fascial planes of the genitalia and later involvement of the skin. Infection of the Colles fascia may spread to the penis and scrotum through the Buck's fascia and the anterior abdominal wall via the Scarpas's fascia.[6]

FG is urological emergency, and current management is based on a multimodal and multidisciplinary approach consisting of aggressive resuscitation with intravenous fluids including blood transfusion, urgent radical surgical debridement, and initiation of broad antibiotics.[12-15]

Despite this aggressive approach to management, FG is associated with significant mortality. This has led to the use of different validated scoring systems such as FG Severity Index (FGSI) and the Uludag FGSI (UFGSI) in order to prognosticate survivals in the affected patients.[16,17]

We present our experience in the management of patients with FG in a resource-constraint setting in Northwestern Nigeria.

PATIENTS AND METHODS

This was a descriptive retrospective study of 47 out of 77 patients diagnosed and managed for FG at Usmanu Danfodiyo University Teaching Hospital from January 2001 to June 2017. Case notes of patients who were clinically diagnosed to have FG were retrieved from the medical records and information consisting of patient demographics, mode of presentation, site of infection, comorbid medical conditions, wound culture results, duration of admission, treatment and outcomes of management were entered into a pro forma and data were analyzed using IBM, Statistical Software Package for Social Sciences, version 25 (2018), Chicago, IL, USA.

Protocol of management for patients with Fournier's gangrene in our institution

After admission, patients were resuscitation with intravenous fluids, blood transfusion where indicated and triple antibiotics administered intravenously. These include ceftriaxone, gentamicin, and metronidazole. Gentamicin was not given for the patient with chronic kidney disease. Patients subsequently had serial debridement, hypertonic saline bath twice a day, wound dressing with povidone-iodine and honey. Wound was covered with appropriate cover depending on the size of the defect when healing by secondary intention was not achieved. Plastic surgeons were involved when the wound defects were penile and or extensive.

RESULTS

A total of 77 patients were managed for FG within the study period but only 47 patients with complete data were analyzed. The mean age of the patients and age range were 42.7 ± 19.4 years and 7 weeks to 72 years, respectively. The presentations include scrotal/penile pain in 25 patients (53.2%), fever in 32 patients (68.1%), scrotal/penile swelling and discharge in 37 patients (78.7%). The disease start with an early phase of cellulits involving penoscrotal area before full thickness gangrene with shameful exposure of the testes as shown in Figures 1 and 2 respectively. The most common sites affected scrotum and or penis which occurred in 42 patients (89.3%). Other details are shown in Table 1.

Urologic conditions were found in 20 patients (42.6%), and it was idiopathic in 15 patients (32.0%). Other risk factors are shown in Table 2.

Other coexisting risk/comorbidities present include congestive heart failure in three patients (6.4%),

Table 1: Distribution of Fournier's gangrene

Site	Number of patients	Location
Scrotum	25	53.2
Penoscrotum	11	23.4
Penis	6	12.7
Scrotum, penis, thigh, anterior abdominal wall	5	10.7
Total	47	100

hypertension in two patients (4.2%), chronic renal failure in one patient (2.1%) and organic mood disorder in one patient (2.1%). Wound culture was done in 15 patients (31.9%), and the most common organism isolated was *Escherichia coli* in seven patients (14.9%). Other organisms isolated include *Staphylococcus aureus* in three patients (6.4%), *Proteus mirabilis* in two patients (4.3%), *Salmonella*, *Pseudomonas,* and *Klebsiella* species in one patient (2.1%) each.

Urine was diverted in 19 patients (40.4%) which was suprapubic in 25% and urethral in 14.9%.

The wound healed by secondary intention in 10 patients (21.3%) with small penoscrotal wounds <3 cm. Wounds were closed by simple closure in 16 patients (34.0%), split-thickness skin graft was done in seven patients (14.9%) with penile wounds, and advancement flap was done in two patients (4.3%) with at least 50% loss of scrotal skin.

The mean duration of symptoms, admission, FGSI, and UFGSI scores is shown below in Table 3. The patients presented late and were on admission for at least a month.

Thirty-two patients (68%) were discharged home after successful management. The mortality rate was 17%. Other details of the outcome are shown in Tables 4 and 5.

Table 2: Risk factors for Fournier's gangrene

Risk factor	Number of patients (%)
Idiopathic	15 (32.0)
Urethral stricture	8 (17.1)
Diabetes mellitus	5 (10.6)
Perineal trauma	4 (8.5)
Urinary tract infection	3 (6.4)
Postoperative	3 (6.4)
Retroviral disease	3 (6.4)
Anorectal disease	2 (4.2)
Prostate cancer	1 (2.1)
Phimosis	1 (2.1)
Pott's disease	1 (2.1)
Transverse myelitis	1 (2.1)
Total	47 (100)

Table 3: Mean durations of presentation, admission, and Fournier's gangrene severity scores

Parameter	Mean±SD	Range
Symptoms (days)	12.6±11.7	2–60
Admission (days)	34.1±29.5	1–109
FGSI	4.1±3.6	0–13
UFGSI	6.7±4.2	2–20

SD: Standard deviation, FGSI: Fournier's Gangrene Severity Index, UFGSI: Uludag FGSI

Table 4: Outcome of Fournier's gangrene

Parameter	Number of patients (%)
Discharged	32 (68)
Absconded	7 (15)
Died	8 (17)
Total	47 (100)

Table 5: Analysis of variance for Fournier's gangrene outcome using severity scores

Parameter	Mean score±SD	*P*
Discharged		
FGSI	3.2±3.2	FGSI
UFGSI	5.4±3.3	0.05
Absconded		
FGSI	4.7±0.9	
UFGSI	8.0±2.1	
Dead		
FGSI	9.2±3.7	UFGSI
UFGSI	12.5±5.7	0.04

FGSI: Fournier's Gangrene Severity Index, UFGSI: Uludag FGSI, SD: Standard deviation

DISCUSSION

FG is a rare urologic emergency, and most published articles are case reports or case series that involve limited number of patients.[18,19] However, Sorensen *et al*.[20] in a population-based epidemiological review found that FG patients are rarely admitted to most American hospitals and have an incidence of 1.6/100,000 males, and this represented 0.02% of hospital admissions. In our study, 77 of patients were diagnosed to have FG though complete records could only be obtained in 47 patients. The age of the patients varied from early childhood to the elderly as has been similarly documented by other authors.[3,4,21] However, this occurrence in young children differs in studies by Eke,[15] Sorensen *et al*.,[20] and Asseban *et al*.,[22] and this difference may be due to differences in home hygiene and care of children in the different populations. The mean age of patients in this study was 42.7 years, and this is similar to reports by Aliyu *et al*.[21] from Maiduguri, Nigeria, and Chalya *et al*.[23] in Tanzania whereas, studies from Canada,[19] United States of America,[20] Morrocco,[22] Egypt,[24] and Turkey[25] showed a higher mean age of above 50 years for patients presenting with FG. The lower mean age of presentation in our study is due to the lower life expectancy and the younger age of the present study population.

All the patients in this study were males as been similarly reported by Aliyu *et al*.[21] and Ghnnam.[24] Exclusive presentation in males with FG in our practice is probably due to the pattern of referral in our practice, whereby patients with perineal or scrotal gangrene are preferentially sent to the urologists if males but to the gynecologists if females. This pattern of referral ensures that female patients with FG are managed by the gynecologists.

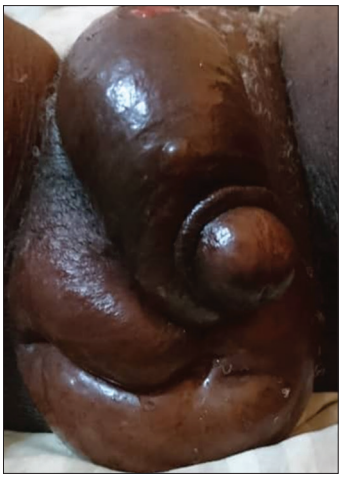

Figure 1: Scrotal and penile swellings in early phase of Fournier's gangrene

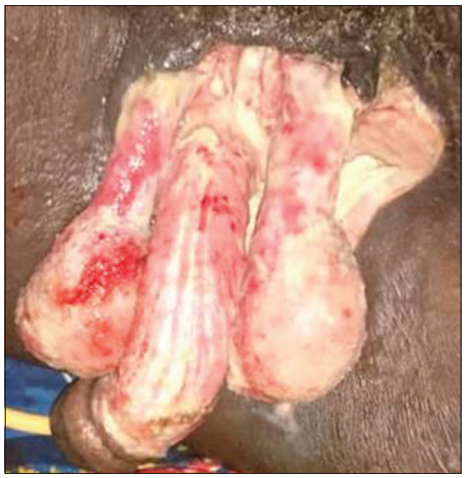

Figure 2: Established Fournier's gangrene affecting scrotum and penis

There was significant delay in patient presentation to the urologists, and this occurred in mean of 12.6 days with a range of 2–60 days. The delay is due to the remote locations of patient's residence making access to health services difficult coupled with the near absence of any form of health insurance for the rural dwellers. As such, sick patients and relatives have to source for funds which may entail sale of domestic animals or farm produce prior to hospital visit, and these further contribute to the delay in presentation. The delay in presentation is associated with higher scores in both FGSI and UFGSI, thus higher morbidity and mortality.

Involvement of the scrotum, penis, thigh, groin, and anterior abdominal wall in our patients further indicates significant delay and late presentation as been reported by Avakoudjo *et al*.[26] In this study, 10.7% of the patients had gangrene localized to the penis without involvement or extension to the scrotum or anterior abdominal wall. This is part of the spectrum of the FG syndrome as has been reported in our center by Ntia and Mungadi[27] as well as by Turo *et al*.[28]

Comorbid diseases in this series were found in only 31.9% of the patients, and these included diabetes mellitus, retroviral disease, and congestive cardiac failure. Diabetes mellitus has been identified as the most common comorbid condition in patients with FG.[6,9,10] Retroviral disease, a common and emerging scourge in Sub-Saharan Africa, has had a profound impact on the course of FG. The two aforementioned disease entities induce host immunosuppression that creates and maintains the environment for the acute spreading penoscrotal, perineal necrotizing fasciitis. Three of our patients developed FG following generalized anarsarca that occurred in congestive cardiac failure. The scrotal edema occasioned by the cardiac disease was the predisposing factor and nidus for the scrotal infection in these patients.

Microorganisms commonly associated with FG are a combination of aerobic and anaerobic organisms that usually reside below the pelvic diaphragm and external genitalia.[15] In our study, anaerobic specimen culture was not done, as this was not available as at the time of presentation. However, the most commonly isolated microbes in those patients who had wound culture *E. coli*, *S. aureus,* and *Proteus* species as has been reported by Chalya *et al*.[23] and Tang *et al*.[29]

The standard approach to the management of FG is a multidisciplinary, multimodal treatment and this involves prompt resuscitation, broad-spectrum antibiotics consisting of antibiotics that are effective against the mixed anaerobic and aerobic microorganisms, serial debridement that may be followed by an array of perineal and penoscrotal reconstructive procedures depending on the nature of the defect.[6,15,30,31] After the initial immediate resuscitation, commencement of broad-spectrum antibiotics, our patients had wound care that involved immediate debridement in 33 (66%) of the patients in those with significant necrotic slough. Of these, 29 of the patients had repeated wound debridement as the initial procedure was not adequate. Patients also had Sitz bathe and wound dressing using 10% povidone-iodine. Complete wound healing by secondary intention was achieved in 10 (21.3%) of our patients without the need for further surgical reconstruction. Quite a number of the patients in this study underwent simple closure of the scrotal defects as earlier documented by Akilov *et al*.,[32] and this obviated the need for skin grafting or scrotal flap reconstruction. Skin grafting was applied in those patients with penile skin

defects, whereas advancement scrotal flaps were applied in those in whom neither wound healing by secondary intention nor primary scrotal skin closure was possible.

Fecal and urinary diversion have been carried out in patients with FG, as this has been found to improve outcomes in such selected patients with FG.[1,6,13,33] In this study, however, there was no indication for fecal diversion, though 19 patients had urinary diversion in the form of urethral catheterization or suprapubic cystostomy. The patients who had suprapubic cystostomy were mainly those who had penile involvement as urethral catheterization was no suitable for such patients.

Use of hyperbaric oxygen and vacuum-assisted closure device either singly or in combination was reported to yield good results in the developed world,[34-38] and these adjuvant modalities were not applied on our patients as these are not available in our practice. Hypertonic saline bath is simple, cost-effective, and produced the same results in our patients as reported by other study in resource-constraint settings.[21]

Despite this aggressive approach to management, FG is associated with significant mortality. The mortality rate in this study was 17%. This is similar to the finding of Tarchouli *et al*.,[39] however, higher mortality rates have been reported by Oymacı *et al*.,[40] (18.8%), Ersay *et al*.,[41] (22.8%), and Benjelloun el *et al*.[42] The lower mortality rate in this study may be attributed to selective presentation by patients who had survived the initial septic state or may be the probable higher immunity in a population that have been exposed to chronic and recurrent microbial infections.

The high mortality rate in FG has led to the use of different validated scoring systems as a means of predicting probable outcomes in these patients.[16] These scoring systems include the Laboratory Risk Indicator for Necrotizing Fascitis,[43] FGSI,[44-46] and its modifications, the UFGSI,[47] and the simplified FGSI.[48-50] The FGSI is based on physiologic and metabolic status of the patients and was first described in 1995.[50,51] The score is estimated from analysis of the standard vital the signs usually collected at the emergency room and consists of nine clinical and laboratory parameters such as temperature, pulse rate, respiratory rate, serum sodium, potassium, bicarbonate, creatinine, hematocrit, and white blood cells, while its modification in the UFGSI involves addition of age and dissemination scores introduced in 2010.[51] When FGSI score is ≥9, there is 75% probability of mortality, while score <9 has 78% probability of survival. Uludag score (UFGSI) ≥9 has sensitivity and specificity of 94% and 81%, respectively. In the present study, the patients that died had FGSI and UFGSI of 9.2 ± 3.7 and 12.5 ± 5.7, respectively, while the patients that survived had FGSI and UFGSI of 5.4 ± 3.3 and 3.2 ± 3.2, respectively, (P = 0.04, 0.05) as reported by the previous studies.[45,46,51] Among the patients who absconded from the hospital during the period of admission, mean FGSI and UFGSI were 4.7 ± 0.9 and 8.0 ± 2.1. These patients did not die on admission but had absconded from admission due to prolonged hospital stay with the resultant economic cost in lost man hours and financial difficulties in an environment of near absence of viable health insurance.

CONCLUSION

FG is not an uncommon urologic condition in our practice, occurs mainly in younger patients who usually present late for treatment and often have underlying diseases. Prompt and adequate resuscitation, aggressive debridement, and appropriate broad-spectrum antibiotics give favorable outcome. Use of hypertonic saline bath is effective in resource-constraint setting.

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Conflicts of interest
There are no conflicts of interest.

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