

Clinico-Pathological Profile and Management Outcome of Fournier's Gangrene in a Tertiary Care Hospital

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ABSTRACT

Background: Fournier's gangrene is a vascular disaster of infective origin occurring about male external genitalia. Diabetes Mellitus is an important predisposing factor. A good number of patients of this rare clinical entity are admitted frequently in our centre. Till now the disease has the potential for significant morbidity and also mortality.

Objective: The study was designed to be conducted among patients suffering from Fournier's gangrene to identify the possible source of sepsis, to denote pattern and extent of area involvement and microorganisms isolated and to observe the treatment course and outcome.

Methods: This prospective observational study was carried out in BIRDEM General Hospital, Dhaka among 60 patients of Fournier's gangrene admitted under surgery department during the period of October 2016 to January 2018 using purposive sampling method.

Result: The results of this study suggest that majority of the study population were in 51 to 60 years (Mean 52 ± 4.9) age group. All the patients were diabetic with grossly elevated blood glucose level (Mean RBS=17.3 mmol/dl). In addition to scrotum, perineum, penis, buttock and lower abdomen were also affected to variable extent (73.3%). All patients required major debridement which had to be repeated in 68.3% cases. *Staphylococcus aureus* was the most common organism isolated (43.3%) followed by *Escherichia coli* (35%) and majority were of polymicrobial type (61.6%). Mortality rate was 8.3%.

Conclusion: The diagnosis and treatment of Fournier's gangrene is enigmatic and challenging to the physician. Urgent surgical debridement along with other appropriate supportive measures can reduce morbidity and mortality.

Key Word: Fournier's gangrene, Necrotizing fasciitis

Introduction

Fournier's gangrene is a rapidly progressive infection of the male external genital, perineal and perianal region with occasional cranial extension to the lower abdominal wall. It is a nasty infective disaster of vascular origin. It is characterized by a synergistic, necrotizing fasciitis (NF) leading to the thrombotic occlusion of small subcutaneous vessels and the development of gangrene.¹ Often the initiating event is idiopathic.

Jean Alfred Fournier first described the condition in 1883 as 'fulminant gangrene' of the scrotum and penis. Cardinal points of his description² included: 1) Sudden onset in a hitherto healthy young man 2) Rapid progression to gangrene and 3) Absence of definite cause. Some authors have tried to classify the condition in primary and secondary forms.³ A compromised definition of Fournier's gangrene was

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proposed by Smith *et al*⁴ as an infective necrotizing fasciitis of the perineal, genital and perianal region. The major sources of sepsis are local skin, colon, anus, rectum and lower urinary tract.

The majority of patients with Fournier's gangrene are immunocompromised and thus the primary wound might have been minor or might have arisen from an otherwise uneventful surgery.⁵ Diabetes mellitus, advanced malignant disease, obesity, peripheral vascular disease, local trauma, urethral stricture and perianal disease have been cited as the main predisposing factors.⁶

At the initial stages of presentation, it has a paucity of clinical signs and is difficult to differentiate it from cellulitis. A high index of suspicion is needed to diagnose it. According to the microbiological characteristics, NF is classified into Type 1 (synergistic polymicrobial infections including anaerobes) and Type 2 (mono microbial infections), the former being more common.⁷ The most common mono microbial infection causing organisms include Beta-hemolytic Streptococcus, Staphylococcus aureus, and Clostridial species. Common poly microbial synergistic infection causing organisms includes *S. aureus*, Streptococcus pyogenes, Enterococci species, Escherichia coli, Pseudomonas species, and anaerobic organisms such as Bacteroides.⁸

The precise pathogenesis of Fournier's gangrene is unclear. Inoculation of microbes can occur through minor trauma, insect bite, boil, perianal and perineal surgery etc. Under favorable environmental conditions such as immune compromised states, diabetes mellitus, liver failure and renal failure, organisms multiply to commence disease process.⁹ The process at first starts in deep tissue plane, so superficial skin signs may not be evident initially. This may lead to delay in diagnosis of this condition. Some patients present with toxic features due to sepsis without any/minimal underlying signs. Later, they may develop edema, erythema, tenderness, bullae, gangrenous skin patches and crepitus.¹⁰

NF in general is usually diagnosed by clinical features, but other investigations may help to

confirm it. Plain X-ray may show subcutaneous gas. Computed tomography scan and magnetic resonance image may show asymmetrical fascial thickening, fat stranding, and gas tracking along fascial planes.¹¹ Tissue biopsy reveals necrosis, polymorph nuclear infiltration and thrombosis of vessels. The management includes initial resuscitation, supportive care, adequate control of risk factors such as blood sugars; extensive debridement as early as possible which may have to be repeated, intravenous antibiotics and blood transfusion.⁹ The mortality rates of NF have remained alarmingly high with reported mortality rates ranging from 20% to 30%.¹¹ Studies have shown that delay in the diagnosis and consequently delayed operative debridement has caused increase in the mortality.¹⁰

Fournier's gangrene occurs worldwide as well as in our country. Although there is scarcity of statistical data regarding its incidence in our country, we regularly get a good number of patients in our hospital. The purpose of this study is to look at Fournier's gangrene in terms of its clinical consequences and microbiological characteristics.

Materials and Method

During the study period, a total of 60 patients with Fournier's gangrene were admitted to surgery department of BIRDEM general Hospital. Thorough clinical assessment and relevant investigations were done. Diagnosis in all the cases was made on clinical basis. Urgent resuscitation in appropriate cases with fluid with or without blood transfusion and IV antibiotic therapy was instituted along with tetanus prophylaxis. Aggressive surgical debridement and drainage of pus followed by repeated minor debridement / dressing over days / weeks led to transformation of the lesion into healthy granulating wound. Wound closure was done by secondary suture, split skin graft or pedicle flap with or without unilateral orchidectomy. Patients were discharged after complete / near complete healing of scrotal wound and were followed up for 6 months. All the relevant data were collected prospectively, compiled then analyzed and our findings were compared with that in the literature.

Result

A total of 60 patients with Fournier's gangrene treated in BIRDEM Hospital between June 2016 to March 2018 were studied. Age of the patients was from 27 to 75 years (mean age 52 ± 4.9 years) mostly between 40 and 60 years (Table-1).

Table -1: Age distribution of the study population

Age (years)	Number of patients (n)	%
<20	0	00
21-30	02	3.3
31-40	05	8.3
41-50	14	23.4
51-60	26	43.3
61-70	10	16.7
>70	03	5
Total	60	100
Mean \pm SD	52 \pm 4.9	

Among the associated risk factors, most frequent was diabetes mellitus which was present in all the cases (Table-2). In only 3 cases there was history of alcoholism (5%).

Table-2: Associated risk factors

Risk factor	Number of patients (n)	%
Diabetes mellitus		
Alcoholism	60	100
	03	05

Duration of diabetes ranged from 0 (newly diagnosed) to 22 years with mean duration of 12.3 years. On admission, in all the cases (100%) diabetes was uncontrolled. Diabetic ketoacidosis was present in 3.3% cases. Previous glycaemic control was unsatisfactory in 93.3% cases as assessed from diabetic record book (Table 3).

Table-3: DM profile of the patients

Variables	Number of patients (n)	%
Duration (Years)		
<05	09	15.0
6-10	15	25.0
11-15	25	40.0
16-20	09	15.0
>20	03	5.0
DM on Admission (RBS mmol/L)		
<7.8	11	18.3
7.8 - <14.0	31	51.7
14.0 - 20.0	18	30.0
>20.0	00	0.0
Controlled	16	100.0
Uncontrolled		
DKA on admission		
Present	02	3.3
Absent	58	96.7
Previous glycaemic control		
Satisfactory	04	6.7
Unsatisfactory	56	93.7

Out of 60 cases, underlying aetiological process could be traced in 68.3% cases (Table-4). The commonest cause was local skin sepsis (36.7%) cases, followed by anorectal sepsis in 28.3% cases. No cause could be found in 31.7% cases (Idiopathic).

Table-4: Underlying aetiological factors

Aetiology	Number of patients (n)	%
Idiopathic	19	31.7
Perianal abscess	17	28.3
Local skin sepsis	22	36.7
Periurethral abscess	02	3.3

Pus / wound discharge was taken from all 60 cases for culture and sensitivity test. 93.3% patients yielded growth of many types of organisms in varying combination (Table-5). Monomicrobial infection was detected in 31.7% cases and polymicrobial infection in 61.6% cases. Anaerobic culture was not performed.

Table-5: Bacteriological profile

Variables	Number of patients (n)		%
Culture negative	04		6.7
Culture positive	Monomicrobial	19	93.3
	Polymicrobial	37	
Organism isolated			
Staphylococcus	18		30
Streptococcus	26		43.3
E. coli	21		35
Klebsiella	08		13.3
Enterococcus	10		16.7
Pseudomonas	12		20

The necrotic process had variable extension to surrounding tissues (Table-6). The scrotum was involved in all the cases. In addition, perineal extension was noted in 38.3% cases, penile in 8.3% cases, thigh and buttock in 16.7% cases and lower abdominal in 10% cases. 2 patients had very extensive tissue loss reaching up to thoracic wall and axilla.

Table-6: Area involved in necrotic process

Area involved	Number of patients (n)	%
Scrotum	60	100
Perineum	23	38.3
Penis	05	8.3
Thigh & buttock	10	16.7
Lower abdominal wall	06	10.0

Urgent resuscitation with fluid and/ or blood transfusion was undertaken in 25 (41.7%) cases. They had extensive areas of gangrene with associated toxemia and multi-organ dysfunction. Combination injectable antibiotic (Ceftriaxone+ Metronidazole) was started initially in all the cases and later on reviewed on the basis of clinical response and culture sensitivity report. Diabetes was brought under control and maintained by insulin therapy. Nutrition was maintained by enteral feeding.

Prompt debridement of necrotic skin, fascia and other non-viable tissue was done in all 100% cases (Table 7) and it had to be repeated in the majority of patients (68.3%). On average, each patient had been debrided 1.95 times.

Table-7: Number of debridement

Number of debridement	Number of patients (n)	%
01	19	31.7
02	29	48.3
03	08	13.3
04	04	6.7
Total	60	100

In our series, five patients died during the course of treatment despite prompt initial resuscitation and urgent debridement (Table 8). 2 of them had concomitant ischemic heart disease and developed MI. In other cases, severe sepsis preceded multi organ dysfunction and failure.

Table-8: Mortality

Outcome	Number of patients (n)		%
Survival	55		91.7
Death	MODS	03	8.3
	MI	02	

Debridement was followed by regular dressing until healthy granulation tissue appeared (3 – 8 weeks). Depending on the size of the wound, different techniques were applied for the closure of the wound. In the majority of the patients (50.9%) wound closure was achieved by secondary suture with or without unilateral orchidectomy (Table 9). Unilateral orchidectomy had to be done in 7.3% cases in order to effective wound closure due to extensive scrotal tissue loss. Both testes had to be implanted in the thigh in 3 cases. Partial thickness skin graft was used to cover the defect in 34.5% cases, wither as sole technique or as an adjunct to cover the residual defect after secondary suturing. In 14.6% cases, locally based pedicle flap was done.

Table -9: Methods of wound closure

Technique applied	Number of patients (n)	%
Direct secondary closure	24	43.6
Secondary closure with unilateral orchidectomy	04	7.3
Secondary closure with skin graft	12	21.8
Partial thickness skin graft	07	12.7
Local pedicle flap	08	14.6
Totla	55	100

All the patients were followed up at OPD 2 weeks after discharge and then monthly for 6 months. 23.6% patients complained of tightness of perineum on squatting and 9.1% patients complained of painful erection (Table 10) which gradually diminished over 2 to 3 months to a tolerable limit. Four patients in the unilateral orchidectomy group were psychologically upset, due to altered body image. They were treated by psychotherapy and gradually adapted to the altered body image. 7.3% patients complained of erection failure and were treated successfully with counseling and drugs. Outcome was cosmetically poor (16.4%) particularly in those who had partial thickness skin graft as sole method. Rest of the patients of the series were found well and returned to normal social life.

Table-10: Chief complaints on follow-up

Complaints	Number of patients (n)	%
Tightness of perineum	13	23.6
Painful erection	05	9.1
Psychological upset	4	7.3
Erectile dysfunction	04	7.3
Poor cosmesis	09	16.4

Discussion

Contrary to Fournier's specification of male youth in his description of Fournier's gangrene, there is an increasing age of patients suffering from the disease as suggested by Laor *et al* and Bahlmann *et al*.³ This is also the case in our study where the maximum numbers of patients were in the age group

of 41 to 60 years (66.7%). Far from being idiopathic, the origin of sepsis can generally be located at one of the three sites: local skin, the urinary tract and anorectal region.¹² In our series, we could ascertain underlying aetiology in majority (68.3%) of the cases.

Certain systemic conditions are frequently encountered in association with Fournier's gangrene to suggest a causal rather than a casual relationship. Diabetes has been frequently mentioned as an associated factor in the aetiology of Fournier's gangrene.¹³ In our series, all the patients were diabetic, which reflects the truth of the above statement. Although ketoacidosis was found in 3.3% cases, diabetes was uncontrolled in 100% cases.

Microbiological profile of the study population suggests that in approximately 93.3% cases culture was positive for the wound swab/pus/discharge. In 61.6% patients, it was associated with poly-bacterial infection and in 31.7% cases, monobacterial infection. *Streptococcus pyogenes* (43.3%) was found to be the most common organism isolated in our study followed by *Escherichia coli* (35%). In their experience of 38 patients, Hejase *et al*¹⁴ found that 90% of the patients grew polymicrobial organisms, including gram positive and gram negative rods and gram positive cocci. The main strains grown were *Staphylococcus aureus*, *Streptococcus*, *Pseudomonas*, *E. coli* and *Klebsiella*. In 5% of their cases no growth was reported. Korkut *et al*¹⁵ had a 64% positive culture rate of the 36 patients in their case series who had cultures sent during the initial debridement, and the leading micro-organism was *E. coli*. In their review of 70 patients with Fournier's gangrene, Ersay *et al*¹⁶ found that the most frequent bacteria cultured from the wounds were *E. coli* (40.0%), *Bacteroids* (38.6%), *Streptococcus* (37.1%), *Enterococcus* (27.1%), *Staphylococcus* (25.7%), *Pseudomonas* (24.3%), *Klebsiella* (20.0%) and *proteus* (18.6%). However such infection may be the secondary complication of a primary ischaemic process.¹⁷

Treatment of Fournier's gangrene needs to be prompt and individualized. The clinical differentiation of necrotizing fasciitis from cellulitis may be difficult because the initial signs including pain, oedema and

erythema are not distinctive. However the presence of marked toxicity out of proportion to local finding should alert the clinician.¹⁸ In severe cases with extensive area of involvement, preliminary resuscitation with intravenous fluid and/or blood transfusions should be undertaken.¹⁷ In our series, 41.7% patients required such resuscitation.

Other than scrotum (100%), the involvement rates of perineum, thigh & buttock, lower abdomen and penis were 31.7%, 15.8%, 10.0% and 7.5% respectively. Extensive surgical debridement to rid the patient promptly off the necrotic tissue and to prevent rapid spread of gangrene, along with treatment of predisposing conditions, is essential to achieve a cure.¹⁹ In our series, all the patients underwent major debridement to varying extent. Mean debridement time was 1.95. Diabetes was present in all cases and was controlled by short acting insulin.

Closure of the post debridement granulating wound is commonly effected by secondary suturing, as was in our series. However in cases with extensive tissue loss, closure can be effected by sacrificing one of the testicle. Otherwise, wound can be covered by partial thickness graft or local pedicle flap. Scrotal reconstruction using bilateral medial thigh fasciocutaneous flap gives the best result from aesthetic point of view.

The mortality rate averages 20% but ranges from 3 to 45%. High mortality rates are found in diabetics, alcoholics and those with colorectal sources of infection who often have less typical presentation, greater delay in diagnosis and more widespread infection.¹⁸ Causes of death have included severe sepsis, coagulopathy, acute renal failure, diabetic ketoacidosis and multiple organ failure.¹⁷ In our series, mortality rate was 8.3%. This may be attributed to the fact that skin was the commonest source of sepsis in our series and early diagnosis and optimal treatment was ensured through experience gained in dealing a good number of this patients on a regular basis.

Conclusion

Fournier's gangrene is both a pathological diagnosis (necrotizing fasciitis) and a clinical condition (deep perineal sepsis). The diagnosis of a Fournier's

gangrene is clinical. Diabetes mellitus is frequently associated with the disease. The basic treatment of Fournier's gangrene involves prompt and aggressive extirpation of all no viable tissues, limitation and abolition of any infective process present, strict control of diabetes when present and closure of post debridement wound by either secondary closure or by skin grafting or local flap. Despite all measures, mortality of the disease may be high. Physicians should acquaint themselves with this dreadful condition to offer early and effective treatment.

Conflict of interest: none.

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