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Research Paper

Observation On Fournier's Gangrene At Tertiary Care Centre

Dr. Narayan[1]
Dr. Krishna Murari[2]
Dr. Zenith Harsh Kerketta[3]
[1] *Junior Resident III, Department of Surgery, RIMS, Ranchi.*
[2] *Associate Professor, Department of Surgery, RIMS, Ranchi.*
[3]*Assistant Professor, Department of Surgery, RIMS, Ranchi.*
Corresponding Author: Dr. Narayan
Junior Resident III, Department of Surgery, RIMS, Ranchi-834009, JHARKHAND

ABSTRACT
Background:- *Fournier's gangrene is an acute fulminating cellulitis of the scrotum which develops suddenly and often without any apparent cause. The causeless or idiopathic gangrene in a healthy person is an unusual condition. It is a urologic emergency and needs to be managed accordingly.*
Methods:- *An observational study was done on twenty three patients with Fournier's gangrene admitted in the Department of Surgery, Rajendra Institute of Medical Sciences, Ranchi during the period from February 2020 to January 2021. Aim of the study was to observe the various aspects of Fournier's gangrene like predisposing factors, causative organisms, clinical presentation, management and outcome.*
Results:- *Common clinical features included fever, anaemia, foetid odour, malaise, body ache etc, which were usually associated with leucocytosis. Age of the patients ranged from 25-79 years. Majority was elderly in 5th or 6th decade of life. Most of them were from rural background from poor socioeconomic group and had poor personal hygiene. In 39% of cases no definite cause could be found and appeared idiopathic in nature. Routine examinations like total WBC count, differential count, haemoglobin, blood sugar, serum creatinine and pus culture were done. Findings were leucocytosis in 95.65% and anaemia in 65.22% of patients were noted. Increased blood sugar was found in 3 patients. In our study there was no complication observed and no mortality was noted.*
Conclusion:- *Fournier's gangrene is a disease with an explosive onset of gangrene in generally healthy persons, the progress is rapid and usual causes of gangrene are absent in most of the cases.*
Key words:- *Forunier's gangrene, scrotum, cellultis, Streptococcus.*

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I. INTRODUCTION

Fournier's gangrene is an acute fulminating cellulitis of the scrotum which develops suddenly and often without any apparent cause. It is variously known as "Idiopathic gangrene of the scrotum," Perineoscrotal gangrene", "spontaneous fulminating gangrene of the scrotum," "Idiopathic scrotal oedema," "Gangrenous erysipelas of scrotum" etc.

This idiopathic gangrene was first described as a separate disease entity by Jean-Alfred Fournier, a dermatologist of St. Louis Hospital Paris in 1883.[1] He characterised three salient features of gangrene in his case report as an explosive onset of gangrene in an otherwise healthy person, rapid progress of the gangrene and total absence of the usual cause of gangrene.

The causeless or idiopathic gangrene in a healthy person is an unusual condition. It is a urologic emergency and needs to be managed accordingly. Scrotum is an unlikely site of gangrene because this area of human body is richly supplied with blood from different sources and free anastomosis occurs between these arteries.

Since the areolar tissue of scrotum is lax, there is chance that due to this the spread of Infection is facilitated which causes severe oedema of scrotum thus further occluding the vascular supply of the region.

Various authors have extensive work on the subject and many others have reported cases with review of literature. Pioneers among then being Campbell (1922)[2], Gibson (1930)[3], Thomas (1956)[4]. Various other authors have tried to pinpoint the causative organisms and predisposing factors.

Gibson (1930)[3] has divided his cases into two groups. In the first group were those cases in which coincident or antecedent lesions were present like inguinal adenitis or lymphatic obstruction of the region. Second groups was that of those in which the cause was not known. He could isolate the organism in some of his cases. In his fatal cases Clostridium welchi was found to be the causative organism.

Mansfield (1946)[5] compared this oedematous condition of the scrotum to cavernous sinus thrombosis and postulated that thrombosis of veins was the cause of the condition. It is now recognised that the vascular thrombosis is the result and not the cause. Undre and Tilak (1966)[6] found that history of trauma was present in 50 percent of the cases.

More than a century has passed since its first description but the disease is still abounded in controversies. The controversy still exists about the exact aetiopathogenic mechanism involved in the causation of this rare and disastrous condition. Numerous theories have been put forward by various authors from time to time but none of them is capable of explaining exactly all the aspects of the disease.

The epidemiology has changed from the original description in that the disease is no longer restricted to young men but may affect a wide age range from neonates to the very elderly.

Various predisposing factors have been identified like diabetes mellitus, steroids, immunosuppression and alcohol abuse etc. Recently it has been suggested that Fournier's gangrene is necrotizing fasciitis involving the genital, perianal or perineal regions. The infective process leads to thrombosis of subcutaneous and cutaneous blood vessels resulting in gangrene of the overlying skin.

II. AIMS AND OBJECTIVES

To study the various aspects of Fournier's gangrene like predisposing factors, causative organisms, clinical presentation, management and outcome.

III. MATERIALS AND METHODS

An observational study was done on twenty three patients with Fournier's gangrene admitted in the Department of Surgery, Rajendra Institute of Medical Sciences, Ranchi, a tertiary care centre, during the period from February 2020 to January 2021, constituted the materials of this study and the methods included various laboratory investigations and treatment applied to these cases. Prior permission of this study was granted by the Institutional Ethics committee. An informed written consent was obtained from the patient. A case was diagnosed to be that of Fournier's gangrene on the following basis:-

1. Sudden onset of scrotal oedema in an apparently healthy person, with rapidly progressing gangrene.
2. Involvement of scrotum either partially or wholly.
3. Total absence of any obvious cause of gangrene.

The diagnosis was confirmed on the basis of criteria laid down at the beginning of this study.

(a) It was followed by routine laboratory investigation, which included total, differential count of leucocytes, Haemoglobin percent estimation, Erythrocyte sedimentation rate and routine examination of urine.

(b) All patients over 40 years of age with or without the history of diabetes underwent blood glucose estimations both fasting and post prandial. Glucose estimation was also carried out on all patients who demonstrated glucose in routine examination of urine

(c) In selected cases those with any urinary problem or obvious infection also underwent culture of urine.

(d) Pus was taken for culture and sensitivity testing and in the meantime broad-spectrum antibiotics were started.

(e) As soon as a definite line of demarcation of the gangrenous area was apparent (it is apparent in most presenting late) extensive surgical excision of wound under local anaesthesia was carried out.

(f) Irrigation of the wound with normal saline, hydrogen peroxide, Povidone iodine and dressing with EUSOL solution were carried out.

(g) Wound inspection and dressing were carried out on a regular basis and if further dead tissue was visible it was immediately excised.

(h) When the wound became healthy it was covered either with split skin graft or by secondary suturing as per availability of skin.

Until pus culture reports were available, antibiotic coverage included third generation cephalosporin, metronidazole and an aminoglycoside.

At the time of wound excision every precaution was taken to remove as much of dead and necrosed tissue as possible and to preserve all healthy appearing tissues.

Wounds were inspected on a regular basis and any dead tissues appearing subsequently were excised off. After irrigating the area with normal saline and povidone iodine (initially also with hydrogen peroxide – for anaerobes) dressing was done with EUSOL solution until fresh bleeding appeared. As soon as healthy wound appeared they were secondarily suturted or were covered with partial thickness skin graft taken from the thigh or upper arm.

IV. RESULTS

Table – 1: Age incidence

Age group (in years)	No. of patients	Percentage
01 – 10	0	0
11 – 20	0	0
21 – 30	2	8.69
31 – 40	4	17.39
41 – 50	6	26.09
51 – 60	5	21.74
61 – 70	3	13.04
71 – 80	3	13.04

Out of the these 23 patients 19 patients were from rural population and only 4 were from urban population making rural to urban population ratio of approximately 5:1.

Table – 2: Clinical and laboratory findings

Clinical /Laboratory Findings (n= 23)	No. of Patients	Percentage of Total
Scrotal swelling	23	100
Leucocytosis (> 11,000 cmm)	22	95.65
Malaise and body ache	19	82.61
Fever	18	78.26
Anaemia	15	65.22
Foul foetid odour from the wound	12	52.17
Extensive sloughing of scrotal skin	5	21.74
Shock	1	4.35

Majority of the cases had systemic manifestations of infection, which included fever, malaise, and prostration. Fever being the commonest, it was present in 18 out of 23 cases. All patients with fever complained of malaise and body ache. General feeling of ill health was present in all the cases. Scrotal oedema was a presenting feature in all patients. At the time of admission the skin was tense, markedly tender and shining in appearance. Five cases presenting very late had extensive sloughing and foetid odours. One of the admitted patients was in shock and had to be resuscitated with IV fluids, blood transfusion and antibiotics. All the patients with Fournier's gangrene except one had leucocytosis i.e. total leucocyte count greater than 11,000 per cmm. Increased neutrophil count was present in all patients including the one with normal leucocyte count. Majority of the patients (15) were anaemic at the time of admission and two of these patients required blood transfusion. Very foul swelling foetid odour was noted in 12 out of 23 patients. At the onset of the disease the skin was hot, tense, tender and shinning in appearance and in all cases there was swelling of scrotum in association with pain.

Table – 3: Duration between first symptom and the appearance of gangrene

Duration in days	No. of Patients	Percentage of Total
0-1	2	8.69
2-3	8	34.78
4-5	10	43.48
6-7	3	13.04

Appearance of gangrene in these patients ranged from 1-7 days after appearance of the swelling averaging 3.8 days.

Table – 4: Distribution of cases according to socioeconomic status

Socioeconomic group (n=23)	No. of Patients	Percentage of Total
Lower	20	86.96
Middle	3	13.04
Upper	--	--

Most of the patients of Fournier's gangrene from rural population were also from lower socioeconomic group. There was no patient from the upper socioeconomic group.

Table – 5: Predisposing factors in 23 cases of Fournier's gangrene

Predisposing factor	No. of Patients	Percentage of Total
Poor personal hygiene	20	86.96
Smoking	8	34.78
Alcoholic	4	17.39
Steroid ingestion	2	8.69
Diabetes	3	13.04

The most common predisposing factor in our study was poor personal hygiene, which was seen in 20 of the 23 cases studied. Undiagnosed diabetes was found in 3 cases. 8 of the patients were smokers and only 4 were alcoholics. 2 of our patients were asthmatics who were on steroids. Few patients had more than one predisposing factor whereas one had none.

Table – 6: Causes of fournier's gangrene (n=23)

Cause	No. of Patients	Percentage of Total
Trauma (Scratch cuts)	6	26.09
Anorecteal abscess drainage	4	17.39
Surgery (Hydrocele)	1	4.35
Pruritus Ani	3	13.05
Unknown	9	39.13

In large number of cases (9 out of 23 or in 39.13 percent) of cases no cause or source of infection immediately preceding gangrene was identified, each were probably idiopathic cases while in majority of cases some cause of the gangrene could be identified.
It may be that minor trauma was missed by many patients or that the patients considered them to be very trivial to report.

In cases in which a definite cause could be identified, majority (36 percent) of cases were due to some sort of trauma – scratch, cuts or Pruritis ani with itching around the area. 4 of the cases were preceded by the drainage of anorectal abscess while one followed surgery for hydrocele.

Table – 7: Bacteriological findings in Fournier's gangrene

Organism isolated	No. of cases
Streptococcus (alone)	9
Staphylococcus (alone)	4
Escherichia coli (alone)	1
Escherichia coli and streptococcus	3
Streptococcus and staphylococcus	2
No growth	4

Most common isolated organism was streptococcus either alone or in combination with staphylococcus. Other organisms were Escherichia coli either alone or in combination with streptococcus. Clostridium group was not isolated in any case because of lack of facilities for anaerobic culture.

Table – 8: Involvement of scrotum in Fournier's gangrene

Part involved	No. of cases
Most part of scrotum	8
Anterior part of scrotum	10
Posterior surface of scrotum	3
Both testicles exposed	2

Most commonly however, major portion of the scrotum were involved in the majority of cases. In no case were testes involved at any stage of the disease process.

5 cases of Fournier's gangrene presented extremely late with extensive sloughing out of the scrotal skin one of the case was in shock and was resuscitated with I.V. fluids and antibiotics.
There was no mortality or any other serious handicap. All the patients were discharged after satisfactory suturing after the appearance of healthy granulation tissue whereas in some patient in whom skin could not be approximated has wound coverage with partial skin graft. Average duration of systemic toxic symptoms after primary wound excision and debridement was 3.5 days. Two cases with extensive scrotal skin loss, testes could not be lodged in the scrotal sac, hence the testes were transpositioned in the subcutaneous plane on either side of the upper thigh and the skin sutured in the midline in the perineum.

Table – 9: Time relationship of various events

Events	Range	Average duration
Appearance of gangrene of after onset of illness	1-7 days	3.8 days
Disappearance of systemic symptoms after institution of treatment	2-8 days	3.4 days
Duration of hospital stay	16 – 30 days	22.6 days

Patients were usually discharged within 3 weeks exceptions were 3 who took about a month to be discharged. None of the discharged patients has reported back with any sexual or functional problems.

V. DISCUSSION

In our study of 23 patients of Fournier's gangrene the age range was between 25-79 years. Most of the patients (48%) were between the age group of 41-60 years. According to James F. Burpee, et al[7] (1972) age range was 35-75 years and according to Ayumba BR, et al[8] (1998) it ranged from 9-81 years of age. According to Eke N[9] (2000) age range is between 30-60 years.

Basoglu M. Gulo, et al[10] (1997) described women in whom vulva was affected and again according to Eke N[9] (2000) male to female ratio being 10:1. However, in our series no female patient was found or included.

Most of the authors have tried to identify the causative factors in Fournier's gangrene. Commonly identified cause can be grouped into anorectal infections (33%), genitourinary lesion (45%), cutaneous (21%), surgery, trauma, immunosuppression and diabetes mellitus.

Predisposing factors for Fournier's gangrene described in literature are as following: -

(a) Lower socioeconomic group
(b) State of uncleanliness
(c) Diabetes mellitus (40-60%).
(d) Generalised debilitating condition.
(e) Immunosuppression either after organ transplantation or caused by chemotherapy for malignant disease.
(f) Alcohol abuse (25-50%).
(g) HIV infection

In our study low socioeconomic group had been a major factor in the causation of the Fournier's gangrene and it was responsible for about 86% of the total cases. According to Eke N[9] (2000) Fournier's gangrene does occur in affluent as well as poor communities.

In our study we found that in about 26% of cases minor trauma or scratch was responsible for the development of the disease condition. In about 17% of the cases history of anorectal abscess drainage was present but in about 40% of the cases the causative factor was not known. In Fournier's original description the disease too was of idiopathic origin. Clayton (1990)[11] observed that portal of entry of causative bacteria may be urogenital (45%), anorectal (33%) and cutaneous (21%) e.g. periurethral infections, indwelling catheter, traumatic, perianal abscess, occult trauma etc.

Most of the authors (Thomas, 1956[4]; Tan R[12], 1964) in their study have tried to identify predisposing factors for Fournier's gangrene. Some of the aforesaid factors have been identified by us such as low socioeconomic group, uncleanliness, diabetes and alcohol abuse but only a few of them like poor general health can be directly held responsible for such degree of decreased resistance since majority of patients were in apparent good health at the time of presentation. In some of the cases cutaneous injuries like scratch and minor trauma was noted too.

One of the predisposing factors of Fournier's gangrene has been considered to be diabetes; it affects reasonable number of the patients. Since it also decreases the immune competence of the affected person if not adequately controlled. In general diabetics have gangrene of the foot and is usually due to microangiopathic atherosclerosis. It is also due to the fact that the infection in diabetes tends to be more severe than in general population so diabetes may be considered to be an important aetiological factor as previously believed. In our series, too, we encountered with 3 cases of diabetes mellitus having this disease.

In our series, bacteriological study shows that Streptococcus was the predominant causative organism. The bacteriological profile of the cases of Fournier's gangrene in our study and also in previous literature have shown a predominance of mixed bacteriology. Both aerobes and anaerobes are almost invariably present but anaerobes are less frequently isolated.

Campbell (1922)[2] concluded that the condition Fournier's gangrene is erysipelas of scrotum since he isolated streptococcus in four out of his five cases. But his observation was not supported by other authors since the characteristic raised spreading edge of erysipelas is absent in Fournier's gangrene.

Gibson (1930)[3] analysed 56 cases of Fournier's gangrene and identified Streptococcus haemolyticus as the predominant causative organism. This is the same as our study in which also streptococcus appears to be main organism cultured.

Gibson also stated that the condition is a type of gas gangrene but most of the authors were unable to isolate gas-forming organism from the lesion. But recently it has been described that if crepitus is present the presence of clostridium species or other gas producing organism should be suspected, although absent of crepitus does not exclude the presence of gas producing organisms (Eke N, 2000).[9]

Although anaerobic culture was not done in our study, the clinical presentation of none of our cases showed the case of gas gangrene. Neither were the toxic symptoms as severe in gas gangrene nor was there any gas in the scrotum.

According to Asci R & Sarikaya S. et al (1998)[14] a mean of 3.05 different bacteria were isolated and mean of 4 different organisms can usually be cultured from each patients (Eke N, 2000).[9]

Fournier's gangrene is always due to mixed aerobic and anaerobic bacteria. The most common combination of organism in majority of studies has been a combination of streptococci and staphylococci as the causative organism. Although in majority of cases only streptococci have been isolated. This may be due to inadequate attention to isolation of organism in mixed flora. A detailed bacteriological study is required settling this issue.

The initiation of gangrenous process may be due to a definite combination of microoganism or a decreased host resistance or a combination of both of these. Which of the above factors is mainly responsible is still unclear. Bacteriological studies are still insufficient to support or refute one or other hypothesis. It is still not very clear with our present study as to why this gangrene of scrotum affects very few persons in spite of the fact that there is presence of so much infective foci in and around the scrotum in general population.

In our study of Fournier's gangrene at the time of presentation the scrotal skin was erythematosus, oedematous, indurated, blistered and some of the cases frankly gangrenous patches were seen. In some feculent odour was present. Systemic symptoms e.g. fever with chills, tachycardia and dehydration was present. Fever being the commonest and it was present in 18 out 23 cases. General feeling of ill health was present in almost all of the cases. According to Mansfield (1946)[5] the clinical presentation as in review of literature are more or less similar to our findings.

In our study anterior part of the scrotum was affected in most of the cases (10 out of 23), in 2 of the cases testes was exposed and in about 8 of the cases most of the scrotum was involved. According to Gregory (1955)[15] the gangrene was mostly confined to anterior surface and occasionally involved whole of the scrotum. So our findings are similar to that of the Gregory (1955).

In our study testes, inguinal canal or anterior abdominal wall was not affected even in those cases in whom extensive involvement of scrotum was seen. As per Smith GL, et al (1998)[16] too the testes, inguinal canal and anal regions were always spared.

Fairly constant area of involvement in majority of case as reported by others also and observed by us can only be explained on the basis of infective thrombosis of some or all vessels supplying the scrotum, namely the scrotal branches of internal pudendal artery and the superficial and deep external pudendal branches of femoral artery. Testis is never involved because of separate blood supply directly from the aorta.

Mansfield hypothesis is that the disease is a vascular disaster of infective origin may explain the suddenness of onset of Fournier's gangrene. We have visualized thrombosd vessels during primary would debridement which is again true according to Mansfield that the infection does not have any specificity other than existence of a pathogenic organism, which cause rapid thrombosis in vessels supplying scrotum leading to gangrene of the overlying skin.

A condition of infective origin is necrtotising fasciitis in which there is extensive destruction of soft tissue. This condition is similar to Fournier's gangrene in that it is rapid in onset and is usually associated with severe systemic toxic symptoms like Fournier's gangrene. This condition similar to Fournier's gangrene responds quite favorably to surgical wound debridement and other supportive measures.

Although lot of controversy exists in the aetiopathogenesis, predisposing factors etc. of Fournier's disease, there is very little controversy about its management. Aggressive surgical debridement following initial resuscitation with I.V. fluids, broad-spectrum antibiotics and analgesics etc is still the mainstay of treatment. All dead and devitalized tissue is excised and the wound is regularly washed with normal saline and hydrogen peroxide, then dressing was done with povidone iodine and EC solution.

These surgical measures along with the initiation of broad-spectrum antibiotics are very useful in the immediate control of the disease process and rapid recovery of the patient. When healthy and bleeding wound is seen it should be closed with secondary suture, which is possible in the majority of cases. A very few cases may require skin graft or myocutaneous flap, a few may require implantation of the testis in the anterior abdominal or thigh as done in our two of the cases.

Recently there has been shown that the use of topical unprocessed honey has beneficial effects in the treatment of Fournier's gangrene. Honey has been impressive acceleration of the healing process (Mohammad Haidari, et al 2014).[17] Honey has a low pH (3.6) and cutaneous enzymes that digest dead and necrotic tissue. It also stimulates growth and multiplication of epithelial cells and wound edges.

In our series we have seen complete recovery in all the cases without any mortality.

In the initial studies there was mortality from this disease, which ranged from 25-40%. But after the introduction of wide spectrum antibiotics along with more and more case in the diagnosis of this urological emergency and its prompt management there has been a sharp decline in the mortality from this condition. According to Eke N[9] (2000) mortality rate varies from 3-40%.

Advent of broad-spectrum third and fourth generation Cephalosporins and other broad-spectrum antibiotics do not seem to halt the disease process but certainly improve the general condition of the patient, promote wound healing by eliminating the infection and decrease the hospital stay.

There has been described several complications which may cause death if not managed promptly and appropriately. Complications like acute renal failure, ARDS/pneumonia, gastrointestinal bleeding, heart failure and hypocalcemia were more commonly encountered, but in our study we couldn't find any of such complications.

VI. CONCLUSION

It can be concluded that Fournier's gangrene is a disease with an explosive onset of gangrene in generally healthy persons, the progress is rapid and usual causes of gangrene are absent in most of the cases. It affects all age groups, epidemiological variations were noted, and mostly low socioeconomic group was involved. Most of the patients were unhygienic. Most common organism responsible for the disease was Streptococcus.

The diagnosis of Fournier's gangrene is mainly based on clinical grounds and there should be a high index of suspicion. The basic treatment of Fournier's gangrene involves prompt excision of all non-viable tissue, after aggressive resuscitation and early antibiotic treatment, limitation and abolition of any infective process present and occasional anatomical reconstruction.

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