

Original Research Article

A Clinical Study of Fournier's Gangrene

Dr. J. Ravinder Naik¹, Dr. Sudheer Moodadla²

¹Assistant Professor, ²Senior resident, Department of general surgery, Konaseema institute of medical sciences, Amalapuram, Andhra Pradesh, India

*Corresponding author

Dr. J. Ravinder Naik

Email: frootisup@gmail.com

Abstract: Fournier's gangrene is a severe subcutaneous infection that begins adjacent to the portal of entry whether it is urethral, rectal or cutaneous in origin. It is a true urologic emergency that demands early recognition and aggressive treatment with antibiotics and surgical debridement. To analyse the cases of Fournier's gangrene in Warangal area the present study was done in Mahatma Gandhi Memorial Hospital of Kakatiya Medical College, Warangal during the period of November 2009 to October 2011 in the Department of general surgery. The total number of cases for this study are 38. Incidence of Fournier's Gangrene among total hospital admissions is 0.04%. In this study, main features at the time of presentation were scrotal pain (100%), fever (86.84%), scrotal edema (92.01%) and scrotal skin necrosis (86.84%). *E. coli* is the main causative agent (57.9%). 89.47% patients survived after proper treatment.

Keywords: Fournier's gangrene, source of infection, biochemical abnormalities, debridement

INTRODUCTION

Genitourinary gangrene is a potentially lethal disorder characterized by the abrupt onset of a rapidly progressing necrotizing soft tissue infection caused by the organisms that spread along fascial planes causing soft tissue necrosis and destruction. In 1883, A. J. Fournier, a Persian venereologist noted the abrupt onset of a rapidly fulminating genital gangrene of idiopathic origin in previously healthy patients with destruction of the genitalia.

Over the years the natural history of the disease has undergone a shift from Fournier's original description in that:

- It involves a broader age range, including older patients
- In approximately 95% cases, a source can be identified
- It tends to follow a more indolent course following a less abrupt onset

Yet it is a true urologic emergency that demands early recognition and aggressive treatment with antibiotics and surgical debridement. In the Western countries, mortality rate is high, current estimates being approximately 21% [1].

This study presents our findings over the last 3 years with Fournier's gangrene and finds that there are striking dissimilarities with the Western experience.

AIM OF THE STUDY

The aims of the study are:

1. To report the incidence of Fournier's gangrene in this part of the country
2. To report the age distribution of the same
3. To review the mode of presentation of gangrene of the scrotum
4. To note abnormalities in biochemical parameters if any in this disease
5. To lay down parameters for prognostication and study the outcome with the intention of finding if any treatment modality has definite superiority over the others
6. To compare the data with that reported in previous literature with a view to highlight discrepancies if any.
7. To analyze the causes for the same

MATERIALS AND METHODS

The present study is a prospective study. This study details with 38 patients diagnosed as Fournier's gangrene and treated as inpatients at Mahatma Gandhi Memorial Hospital (MGM Hospital) Warangal. The period of the study was from November 2007 to October 2009. A detailed history was taken from all

patients and investigations such as Hb%, W.B.C. count, urine and blood sugar, serum sodium, calcium and albumin were taken at the time of admission. Pus for culture sensitivity was taken at the time of first debridement. All patients underwent debridement within 6 hrs of admission either under general or under local anesthesia.

All the patients on admission were given Inj. Cefotaxime 1gm, Inj. Gentamycin 80mg, Inj. Crystalline Penicillin 40 Lakh Units after testing for sensitivity and Cloxacillin 500mg along with Inj. Metronidazole 500mg. If renal function was compromised, Aminoglycosides were totally omitted. A regime of a Cephalosporin, Aminoglycoside and Imidazole acting against anaerobes was continued till patient was afebrile or till the culture reports came, whichever was later. Most were allowed to heal by granulation. All debilitated patients underwent orchidectomy at the primary debridement. Some form of reconstruction was attempted in all patients with extensive lesions.

Results are analysed and compared with other studies.

RESULTS AND OBSERVATIONS

In our hospital, 94,570 patients were admitted between the study period i.e. November 2007 – October 2009. Among them, the number of cases of Fournier’s Gangrene was 38. Thus the incidence of Fournier’s Gangrene among the total hospital admissions in this part of the country is found to be 0.04 %.

Table 1: Incidence of furnier’s gangrene

Year	November and December 2007	2008	January till October 2009	Total
Total Hospital Admissions	6,797	48,374	39,399	94,570
Total Surgical Admissions	781	5,974	4,752	11,507
Fournier’s Gangrene	3	21	14	38
Incidence of Fournier’s Gangrene among total hospital admissions = 0.04 %				
Incidence of Fournier’s Gangrene among General Surgery admissions = 0.33 %				

Total number of surgical admissions during the same period was 11,507 and hence, the incidence of Fournier’s Gangrene among total admissions under General Surgery at MGM Hospital is found to be 0.33 %.

Table 2: Age incidence of furnier’s gangrene

Age Group (Years)	No. of Patients	Percentage
< 20	0	0
21 – 30	4	10.53
31 – 40	6	15.79
41 – 50	9	23.68
51 – 60	10	26.32
61 – 70	7	18.42
71 – 80	2	5.26
> 80	0	0
Total	38	100

The highest incidence of Fournier’s gangrene is seen to occur in 4th and 5th decades.

Table 3: Presenting features in patients with furnier’s gangrene

Signs and Symptoms	No. of Patients	Percentage
Pain	38	100
Edema	35	92.10
Fever	33	86.84
Erythema	18	47.37
Crepitus	12	31.58
Skin Necrosis	33	86.84
Shock	5	13.16
Altered Mental Status	3	7.90

Thus in our study the main feature at the time of presentation were scrotal pain, fever, scrotal edema and scrotal skin necrosis.

Table 4: Source of infection

Source	No. of Patients	Percentage
Anorectal	6	15.79
Genitourinary	16	42.10
Combination of above	9	23.68
Idiopathic	7	18.43
Dermal	0	0
Total	38	100

In our study, based on the complaints and physical examination, the commonest source of infection is found to be Genitourinary.

Table 5: Factors associated with furnier’s gangrene

Risk factors	No. of Cases	Percentage
Diabetes	25	65.79
Alcoholism	30	78.95
Trauma (Self inflicted / instrumentation / otherwise)	5	13.16
Immunosuppression	3	7.90

In our study a high percentage of cases were Diabetics and Alcoholics. Three were HIV Positive.

Table 6: Extent of lesion

Nature of Lesion	No. of Patients	Percentage
Localised	25	65.79
Extensive	13	34.21

The extent of the lesion was localized in majority of the cases. The extensive lesions often tended to be of anorectal origin and in the diabetics.

Table 7: Time interval between onset of symptoms and presentation at the hospital

Time Interval	No. of Patients	Percentage
< 48 hrs	0	0
48 hrs – 1 week	22	57.90
> 1 week	16	42.10
Total	38	100

None of our patients presented within 2 days. Most of them came nearing 1 week with a mean presentation at 6.6 days from the onset of the disease.

Table 8: Biochemical abnormalities in fournier’s gangrene

Investigation	No. of Patients	Percentage
Anemia	20	52.63
Leucocytosis	12	31.58
Hyponatremia	13	34.21
Increased Serum Creatinine	13	34.21
Hyperglycemia	25	65.79
Glycosuria	16	42.10
Decreased Serum Albumin	6	15.79
Increased BT and CT	1	2.63
Hypocalcemia	12	31.58

In our experience, anemia was the commonest abnormality. Alterations in the normal biochemical values were found significant number of patients. But bleeding and clotting times remained within normal limits in all except for 1 patient.

Table 9: Agents causing the infection – single / multiple

	No. of Patients	Percentage
Single Agent	25	65.79
Multiple Agents	13	34.21
Total	38	100

Our study shows a tendency towards a Monomicrobial infection pattern. An average of 1.45

species was found per person whose lesion was cultured.

Table 10: Bacteriology of fournier’s gangrene

Organism	No. of Patients	Percentage
Staphylococci	9	23.68
Streptococci	4	10.53
E. coli	22	57.90
Klebsiella	9	23.68
Proteus	5	13.16
Pseudomonas	6	15.79
Bacteroides	5	13.16
Clostridium	5	13.16

In our study, *E. coli* was the commonest species found followed by *Klebsiella* and *Staphylococcus*. Anaerobes did not undergo culture and sensitivity testing but were identified by gram stain alone. Stains of smears were made on clinical suspicion or if pus culture for aerobes was negative.

Table 11: Number of debridements done for fournier’s gangrene

Number of Procedures	Number of Patients	Percentage
1	9	23.68
2	13	34.21
3	9	23.68
4	5	13.16
5	2	5.27
Total	38	100

In our study, each patient underwent an average of 2.51 debridements.

Table 12: Procedures done for control of gangrene and reconstruction

Procedures	No. of Patients	Percentage
Debridement with healing by secondary intention	16	42.10
Debridement with secondary suturing	10	26.32
Debridement with split skin grafting	3	7.90
Debridement with Orchidectomy	4	10.53
Debridement with thigh pouch implantation	1	2.62
Debridement with diversion	4	10.53

Table 13: Duration of hospital stay

Duration	No. of Patients	Percentage
< 10 days	6	15.79
11 – 20 days	18	47.37
> 21 days	10	26.32
Total	34	89.48

On an average our patients stayed in hospital for 16 days as inpatients. 4 patients expired and were not included in the study.

Table 14: Duration of hospital stay correlated with diabetes

Status	No. of Patients	Average duration of stay	No. of average debridements
Diabetics	22	19 days	2.2 / patient
Non - diabetics	12	16 days	1.8 / patient

Thus diabetics were found in our study to stay in the hospital for a longer duration and also to undergo more procedures than non – diabetics.

Table 15: Outcome of patients in this series

Outcome	No. of Patients	Percentage
Survived	34	89.47
Expired	4	10.53
Total	38	100

A total of 4 (10.53%) patients with Fournier’s gangrene died in the study.

Table 16: Source of infection and its bearing on mortality

Source	Total No.	No. of Deaths	Percentage of death of cases from that sources
Anorectal	6	2	33.33
Genitourinary	16	0	0
Both	9	1	11.11
Not identified	7	1	14.29
Dermal	0	0	0

33.33 % of patients with an anorectal source of infection died in contrast with those who had a genitourinary source. One patient died with an idiopathic cause of infection. One among the nine patients with both anorectal and genitourinary sources of infection died. Further, the four patients who died were diabetics highlighting the bad prognostic effect that hyperglycemia has on the disease process.

Table 17: Correlation of mortality with clinical features and biochemical abnormalities at the time of presentation

Sign / Biochemical abnormality	No. of Patients with the finding	No. of Patients expired with the findings	Percentage
Crepitus	12	4	33.33
Shock	5	4	80
Anemia	20	4	20
Increased BT and CT	1	1	100
Hyperglycemia	25	4	16
Hypoalbuminemia	6	4	66.67
Hyponatremia	13	3	23.08
Increased serum creatinine	13	4	30.77
Hypocalcaemia	12	4	33.33

It is apparent that Shock at the time of presentation, Increased Bleeding and Clotting time constitute bad prognostic signs. Also, 33.33 % patients with Crepitus and 66.66 % patients with hypoalbuminemia expired.

DISCUSSION

Table 18: Incidence of fournier’s gangrene

	Bejanga [2]	Corman <i>et al</i> [3]	Our Study
Incidence / 10,000 hospital admissions	2.2	1.3	4

Thus the disease burden in our study is more than that reported by Bejanga. However only translation in terms of incidence of disease per 1000 general population will be meaningful and that is beyond the scope of this study as it will require a comparison of the catchment and health care delivery systems contained therein.

Table 19: Age incidence of fournier’s gangrene

	Brown <i>et al</i> [4]		Corman <i>et al</i> [3]	Our Study
	Pre 1945	Post 1945		
Mean	40.9	51.3	51.7	52.0

In our study, the age incidence of Fournier’s gangrene is more or less than same as that reported in the Western literature. However given the shorter life expectancy in our people it may be that Fournier’s Gangrene effectively occurs at an older age in Indians than Westerners [5].

Table 20: Presenting features in fournier’s gangrene

Signs and Symptoms	Percentage of Patients		
	Lamb RL <i>et al</i> [6]	Clayton <i>et al</i> [7]	Our Study
Pain	100	100	100
Edema	86	95	92.10
Fever	72	80	86.84
Erythema	100	100	47.37
Crepitus	62	12	31.58
Skin necrosis	46	86	86.84
Shock	40	8	13.16
Altered Mental Status	32	12	7.90

In our study there is similarity with the previous reports in that pain is universally found but changes in mental state and shock are found far less frequently probably reflecting the more indolent course of the disease in this population. Crepitus is found in a significantly lesser number of patients which is in concordance with the essentially monomicrobial nature of the disease in this country and the fact that Clostridia sp. account for a lesser population of infections.

The fact that ulcer (sequelae of skin necrosis) is found in all patients in our study is likely to be because of delayed presentation and non usage of scrotal ultrasound routinely for painful conditions of the scrotum which may pick up the disease early.

Table 21: Site of origin of infection

Source	Clayton <i>et al</i> [7]	Asci R <i>et al</i> [8]	Our study
Anorectal	46	29.4	15.79
Genitourinary	33	35.3	42.10
Dermal	21	29.4	0
Idiopathic	-	5.8	18.43
Both anorectal and genitourinary	-	-	23.68

In our study, a genitourinary source is found more than twice as commonly as an anorectal one while in the West, some studies [7] implicate the latter as being more common while in others [8] the differences between the two is less pronounced. A higher proportion of patients have no identifiable source in our study. This may be truly idiopathic but a more likely explanation is inadequate work up to find the source of infection.

Table 22: Factors associated with fournier’s gangrene

Risk factors	Spirnak <i>et al</i> [9]	Baskin <i>et al</i> [1]	Our Study
Diabetes	50	21	65.79
Alcoholism	40	60	78.95
Trauma	30	26	13.16
Immunosuppression	12	26	7.90

Alcoholism as a risk factor is more common in India than in the West probably due to the socio-economic class of the patients. Procedure related cases are fewer probably because many urological procedures are done on an OP / day care basis in the United States. Femoral injection of narcotics is also increasingly reported in Europe. Case reports of Fournier’s Gangrene have occurred in HIV positive patients but no consistent relationship has been established with the systemic immunity impairment.

Table 23: Extent of the disease

Lesion	Clayton [7] (N = 57)	Our Study (N = 38)
Localized	72 %	65.79 %
Extensive	28%	34.21 %

Perhaps the earlier presentation and pick up of cases in the west accounts for the lesser percentage of patients with extensive disease. However on applying the Chi Square test it was found that there is no significant increase in the proportion of extensive lesions at the 95 % confidence limits or two standard deviation levels.

Table 24: Time interval between onset of symptoms and presentation at the hospital

Time interval	Stamenkovic <i>et al</i> [10]	Our Study
< 48 hrs	47	0
48 hrs – 1 week	53	57.90
> 1 week	-	42.10

Thus it is apparent that our patients present at a much later stage after the onset of symptoms. This could be due to ignorance, lack of health delivery system at the Primary level but in conjunction with the decreased mortality brings to light the essentially indolent nature of the disease in our people.

Table 25: Biochemical abnormalities in fournier’s gangrene

Biochemical abnormalities	Miller JD [11]	Our Study
Anemia	-	52.63%
Leucocytosis	93%	31.58%
Glycosuria	68%	42.10%
Hyperglycemia	82%	65.79%
Increased BT, CT	44%	2.63%
Hyponatremia	28%	34.21%
Hypocalcaemia	24%	31.58%
Hypoalbuminemia	28%	15.79%
Increased Serum Creatinine	50%	34.21%

Surprisingly a number of values in our study are at odds with the previous literature. Leucocytosis, as

indeed the systemic inflammatory response (as has been seen in earlier tables) is muted in Indian patients. Significant proportions have hyperglycemia and glycosuria. But, clotting abnormalities are present in a minuscule percentage as compared to Miller's study. Hyponatremia is found in a greater proportion of patients but whether this is true or apparent was not measured. Hypocalcaemia is found in greater proportion of patients but this is not statistically significant. However as Somer [12] stated, it is prognostically an ominous sign.

Table 26: Agents causing infection

Organism	Paty R and Smith AD [13]	Our Study
Staphylococci	27	23.68
Streptococci	42	10.53
E. coli	50	57.90
Klebsiella	16	23.68
Proteus	23	13.16
Pseudomonas	26	15.79
Bacteroids	47	13.16
Clostridium	12	13.16

Infections have a propensity to be monomicrobial in our study. An average of 1.45 species per person has been reported. This is at odds with Campbell [14] – 4 species / person and Asci *et al* [8] – 3.05 species / person. In our study a lesser percentage of staphylococci and streptococci are found compared to western studies. This is consistent with our finding where dermal sources of infection are significantly less than those abroad. The lack of anaerobic culture material (only patients with negative cultures were subjected to gram staining to identify anaerobes) could account for the essentially monomicrobial nature of the infections and lesser prevalence of bacteroids. Alternatively the indolent nature of the disease process in our patients may be because the disease tends to have a fewer species of synergistic activity in this country.

Table 27: Number of debridements done for fournier's gangrene

No. of Debridements	Baskin <i>et al</i> [1]	Our Study
	4.0	2.51

Our patients required lesser number of debridements per person in contrast with the report of Baskin *et al* [1] this again shows the more benign natural history of the disease in Indians vis a vis the Caucasians.

Table 28: Definitive treatment and reconstruction procedures

Procedures	Paty R and Smith AD [13] in %	Our Study (in %)
Debridement with healing by Secondary intention	-	42.10
Debridement with Secondary suturing	45	26.32
Debridement with split skin grafting	56	7.90
Debridement with Orchidectomy	10	10.53
Debridement with thigh pouch implantation	31	2.62
Debridement with diversion	87	10.53

In the west a definitive procedure for closure of the wound has been offered in all cases. This may be because of the more aggressive nature of the disease at presentation which warranted a more extensive debridement with a resultant larger area of skin loss. Diversion procedures were also significantly more common than our experience showing that the disease pursued a more fulminant course that required all possible measures to decrease local contamination. A greater awareness of the Western public probably accounts for a trend to preserve the testis as the age incidence in both the studies is approximately the same and younger to that of our patients. As none of our cases went for flap closure, no meaningful comparison can be done.

Table 29: Comparison of mortality in different studies

	Clayton <i>et al</i> [7]	Asci <i>et al</i> [8]	Our Study
Total No. of Cases	57	34	38
No. of Patients who died	12	5	4
Percentage	21.05	14.7	10.53

By applying the Chi Square Test, it is found that this value is significant at 2nd standard deviation level or 95% confidence limits.

Mortality was higher in diabetics than in non – diabetics and also in people who had an anorectal source of infection. This is consistent with the reports of Cohen [15] and Baskin *et al* [1].

As reported by Clayton *et al* [9] hypoalbuminemia appears to have a strong association with mortality in Fournier's Gangrene but whether it is contributory or just a fall out of the lesion is not clear.

Hypocalcaemia does not appear to be as significant in our study as Blanchard RJ [16] reported.

As regards in survivors, the average hospital stay per patient was 19 days. This is in striking contrast with Baskin *et al* [1] who reported an average stay of 40 days. The discrepancy probably can be attributed to the indolent course of the disease in India, a tendency for more radical procedures abroad and a greater preponderance of diabetes in this study.

SUMMARY AND CONCLUSIONS

1. Fournier's Gangrene is not an uncommon disease in this part of the country.
2. The average disease burden is 4 per 10,000 hospital admissions.
3. The disease is most prevalent in the fourth and fifth decades of life.
4. The commonest presenting features are scrotal pain and ulcer followed by scrotal edema, erythema and fever.
5. The commonest source of origin is Genitourinary (42.10 %). In 18.43% of the patients, no source could be identified.
6. Diabetes and alcoholism were found in a significant number of patients.
7. Majority of the patients (57.9 %) presented between 2 days – 7 days from the onset of the disease. No patient presented in the first 48 hours.
8. The extent of disease process was localized in 65.79 % of the cases and extensive in 34.21 %.
9. The most common biochemical abnormality found was anemia, hyperglycemia and glycosuria.
10. Commonest agent causing infection was found to be *E. coli*, followed by *Klebsiella* and *Staphylococci*.
11. Most of the patients were treated by debridement and allowing the wound to granulate secondarily. Average number of debridements required per patient was 2.51. A diversion procedure was done in 10.53 % of the cases.
12. 10.53 % of the cases expired. The average hospital stay for the survivors was 19 days.
13. The mortality as expected is higher in older patients, those with a rectal focus of infection and diabetics. Clearly the disease in most cases is no longer idiopathic as a source of infection can be identified.
14. As compared to previous reports and literature by Western authors, patients in this study were found to present later, less acutely, have a more indolent course of disease with a different spectra of infecting organisms, less species burden per patient and a significantly less morbidity and mortality rate. The biochemical prognostic parameters speculated in earlier literature also do

not seem to be too relevant in light of our findings.

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