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Prospective Study of Cases of Fournier's Gangrene

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Abstract
Background: *Fournier's gangrene is an aggressively spreading infection that initially affects the genitalia and perianal regions with progression to the abdomen and thoracic wall. The hall mark of the disease is gangrene of skin and subcutaneous tissues due to thrombotic occlusion of subcutaneous vessels caused by necrotizing fasciitis.*
Methods*:This* ***is*** *prospective study including 35 cases of Fournier's gangrene at Surgical wards at PDU Civil Hospital, Rajkot between Dec 2017 to October 2019.Patient were diagnosed on basis of clinical examination. FGSI score calculated by vital parameters (heart rate, respiratoryrate, temperature) and laboratory studies (serum sodium, potassium, creatinine, bicarbonate, leukocytes count, hematocrit)*
Results:*Paients age ranges between 20 to 80 years (mean 53.4=12.9 years),approximately 71% of patients were found to be affected from diabetes, i.e. diabetes is most common predisposing factor in our study. The most common source of infection was from the urogenital reagion (15 cases). E. coli was found to be most common organism infecting patients in our study. Mean FGSI score was 3.71=3.46. 3 out of 35 patients were died.*
Conclusion:*Minor infection in predisposed individuals should be given due attention and should be treated promptly as negligence may lead to fatal complications. Imparting proper knowledge to such candidates is primary in helping them to seek proper medical and surgical care in order to prevent further mischievous and dreaded complications. FGSI score greater than 9 should alert the surgeon to carry out immediate and extensive surgical debridement.*
Keywords:*FGSI(Fournier's gangrene severity index), Necrotisingfaciitis.*

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I. Introduction

Fournier's gangrene (FG) is an acute, rapidly progressive and potentially fatal, necrotizing fasciitis of infective etiology affecting the scrotum and penis, perineal and perianal regions. It leads to the thrombotic occlusion of small subcutaneous vessels, resulting in the development of gangrene of the overlying skin. It may extend to the medial aspects of thigh and Anterior abdominal wall and can go onto chest wall. Bauriene[(1)] first reported this form of disease, King Herod the Great of Judaea was found to be affected by the disease and he was probably a diabetic.

He described it as a rapidly progressive necrosis of male external genitalia of idiopathic nature. The genuine and more detailed account of this condition came from a dermatologist in France Dr. Jean A. Fournier in1883.The disease may involve all group of ages, races and both sexes.

The authentic description of the disease was done by J.A. Fournier, a Parisian dermatologist and venereologist, in 1883, specifically in the scrotum. He described it as "fulminant gangrene of the penis and scrotum"based on the findings in five young men with gangrene of the scrotum.[(2)]Frank LamotMeleney (from New York), while in Beijing, China during World War I (1920s) observed a series of cases with extensive skin and subcutaneous tissue necrosis involving extensive areas in the body and found it to be causally associated with streptococcus and termed it "streptococcal gangrene"[(3)] and the term "necrotizing fasciitis" was coined by Wilson in the year 1952.[(4)] Fournier's gangrene is otherwise also known as phagedena, periurethral phlegmon and synergistic necrotizing cellulitis.[(5, 6, 7)] Whole process of necrotizing fasciitis is due to bacteria eating away the tissues and termed it as flesh eating bacteria. However, it was found to be a misnomer because bacteria only cause occlusion of vessels and this in turn results in sloughing of tissues. A comprehensive and widely accepted definition of Fournier's gangrene was proposed by Smith et al [(8)] as 'an infective necrotizing fasciitis of the

perineal, genital or perianal regions'.

TABLE 1: FGSI SCORING SYSTEM

ELEMENT	SCORE								
	4	3	2	1	0	1	2	3	4
TEMP(^{0}C)	>41	39-40.9	-	38.5-38.9	36-38.4	34-35.9	32-33.9	30-31.9	<29.9
PR(BPM)	>180	140-179	110-139	-	70-109	-	55-69	40-54	<39
RR(/MIN)	>50	35-49		25-34	12-24	10-11	-	-	<5
Sr. Na(mmol/L)	>180	160-179	155-159	150-154	130-149	-	120-129	111-119	<110
Sr. K^+	>7	6-6.9		5.5-5.9	3.5-5.4	3-3.4	2.5-2.9	-	<2.5
Sr. CREAT	>3.5	2-3.4	1.5-1.9		0.6-1.4		<0.6	-	
HCT	>60	-	50-50.9	46-49.9	30-45.9	-	20-29.9	-	<20
WBC(/mm^3)	>40	-	20-39.9	15-19.9	3-14.9	-	1-2.9	-	<1
Sr.$HCO3^-$	>52	41-51.9	-	32-40.9	22-31.9	-	18-21.9	15-17.9	<15

METHODS: This is prospective study including 35 cases of Fournier's gangrene, at Surgical wards at PDU Civil Hospital, Rajkot between period of December 2017 to October 2019

INCLUSION CRITERIA:

1. All patients presenting with signs & symptoms of Fournier's gangrene admitted and surgically treated in the hospital.
2. Patients who were willing and ready to give consent for surgical procedure.

EXCLUSION CRITERIA

1. Patients not ready for required surgery.
2. Patients who left the hospital before final outcome.
3. Patients whose hospital records were found to be incomplete.

II. Results

The study was conducted in surgical wards of PDU Medical college and hospital. The following are my observations regarding the epidemiology and etiological clinical features and treatment of patients affected with Fournier's gangrene.

TABLE II: AGE DISTRIBUTION

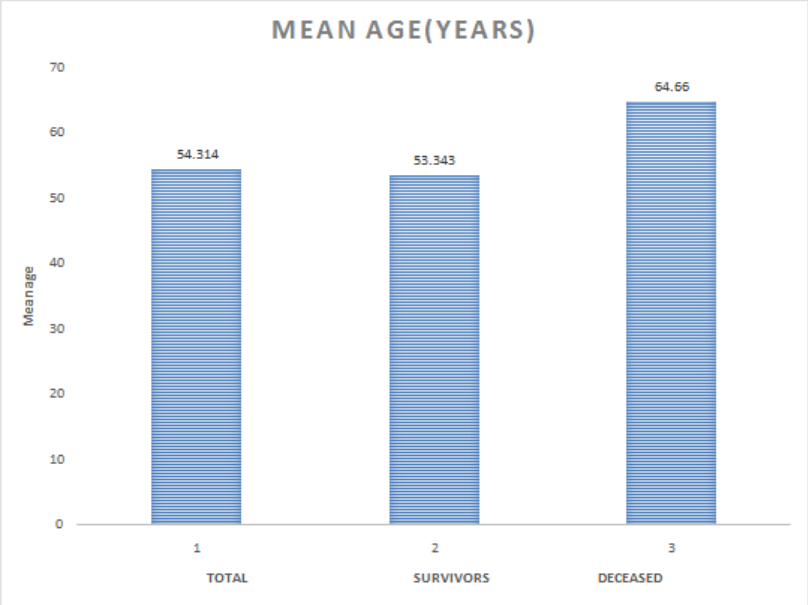
AGE GROUP (YEARS)	SURVIVORS (n=32)	DECEASED (n=3)	% GROUP
20-30	1	NIL	2.8
30-40	5	NIL	14.3
40-50	7	NIL	20
50-60	11	1	34.3
60-70	7	1	22.9
70-80	1	1	5.7

Mean age of all patients in our study were 54.3 ±12.9 years.

TABLE III: SHOWINGMEAN AGE OF SURVIVORS AND DECEASED.

	OUTCOME	N	Mean	Std. Dev
AGE (YEARS)	SURVIVORS	32	53.34	12.61
	DECEASED	3	64.66	14.18

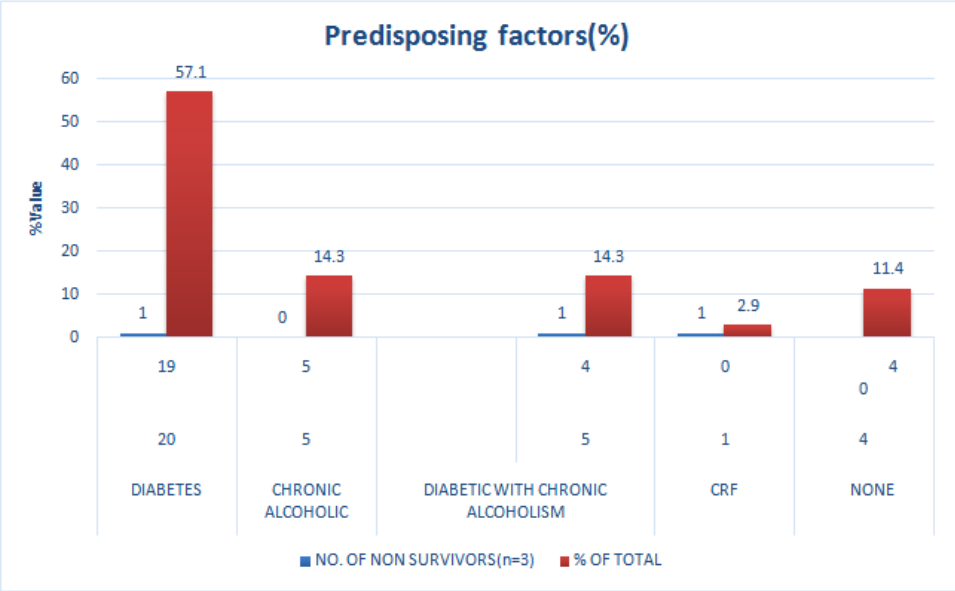
GRAPH I: AGE DISTRIBUTION



TABLEIV: PREDISPOSING FACTORS

PRE DISPOSIG-FCTORS	TOTAL	SURVIVORS (n=32)	NON-SURVIVORS (n=3)	% OF TOTAL
DM	20	19	1	57.1
DM + CA	5	4	1	14.3
CA	5	5	0	14.3
CRF	1	0	1	2.9
NONE	4	4	0	11.4

GRAPH II: SHOWING PREDISPOSING FACTORS

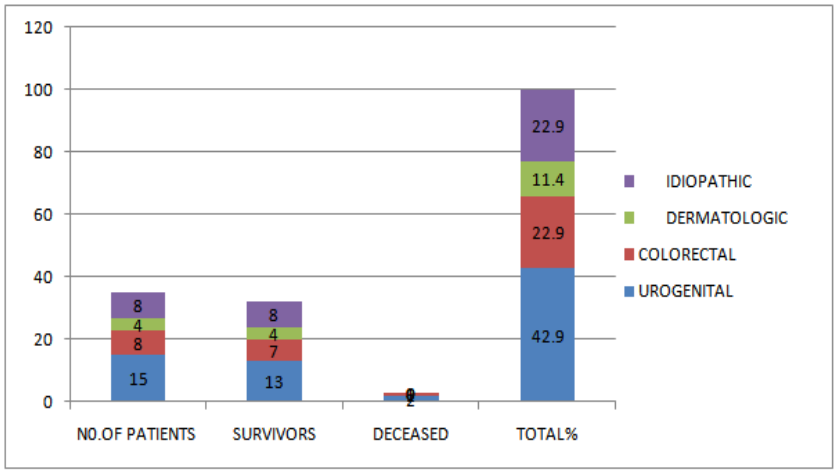


in our study approximately 71% of patients were found to be affected from diabetes, i.e. diabetes is most common predisposing factor in our study.

TABLE V: ETIOLOGICAL FACTORS

ETIOLOGY	No. Of Patients	Survivors	Deceased	Percentage
Urogenital	**15**	**13**	**2**	**42.85%**
Colorectal	**8**	**7**	**1**	**22.85%**
Dermatologic	**4**	**4**	**0**	**11.42%**
Idiopathic	**8**	**8**	**0**	**22.85%**

.GRAPH III: SHOWING ETIOLOGICAL FACTORS



The most common source of infection was from the urogenital area. 15 cases had urogenital etiology, 8 cases had colorectal etiology, 4 cases had dermatologic etiology, in 8 cases there were no source. Among the deceased the most common causes was from urogenital sources.

TABLE VI: MEAN DURATION OF SYMPTOMS

	Mortality	N	Mean duration(days)	Std.Dev.
Variable	YES	32	3.75	2.016
	NO	3	4	1

The symptom onset is defined as the appearance of gangrenous changes, purulent discharge in skin, and elicitation of fluctuation. Most of the patients presented late after the development of symptoms. Mean duration of symptoms in all the subjects were 3.37 days with a standard deviation of 1.94 days, while mean duration of symptoms of survivors were 3.75 days with standard deviation of 2.016 days and deceased were 4 days with standard deviation of 1 day.

GRAPH IV: MEAN DURATION OF SYMPTOMS

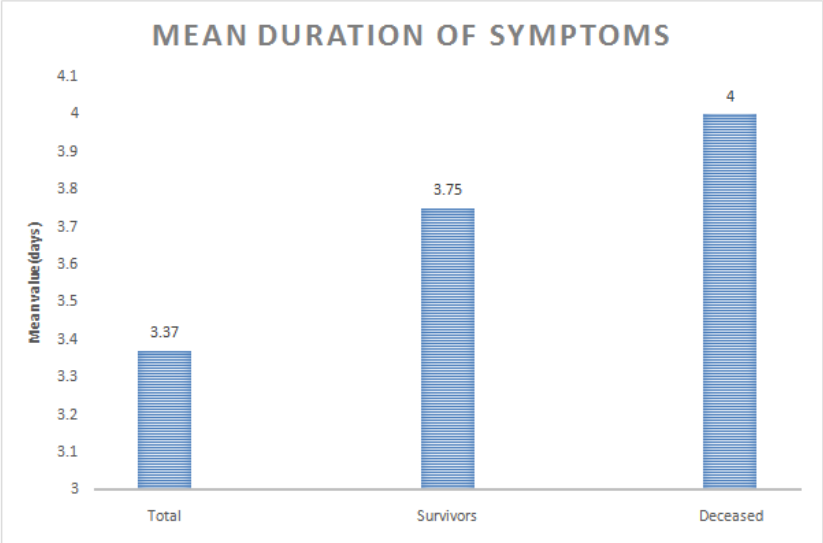
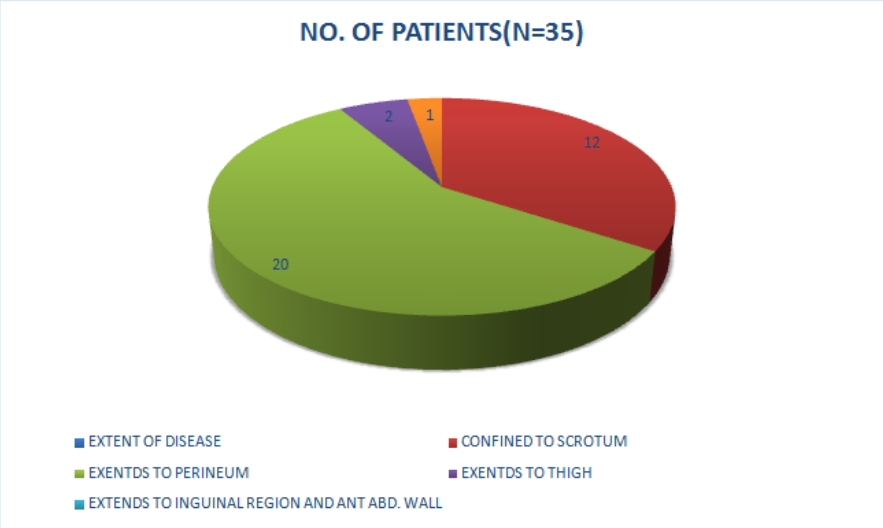


TABLE VII: EXTENT OF INVOLVEMENT

EXTENT OF DISEASE	NO. OF PATIENTS	PERCENTAGE
CONFINED TO SCROTUM	12	34.3
EXTENDS TO PERINEUM, PENIS	20	57.1
EXTENDS TO THIGH	2	5.7
EXTENDS TO ING. REGION AND ANTERIOR AND ABDOMINAL WALL	1	2.8

GRAPH V: EXTENT OF DISEASE



In our study, gangrene was confined to scrotum in only 12 patients, with extension into perineum in 20 patients.2 patients had spreading extensive gangrene to the perineum, medial aspect of thigh. 1 case had extension to anterior abdominal wall.

TABLE VIII: SHOWING WOUND CULTURE

WOUND SWAB (bacteria isolated)	NO. OF PATIENTS (Out of 35 Patients)	DECEASED PATIENTS (N=3)
• E coli	12	2
• Pseudomonas sp.	7	1
• Staph aureus	6	0
• Klebsiella Sp.	5	0
• Bacteroides Sp.	3	0
• No pathogen isolated	2	0

Pus culture and sensitivity were sent for all patients on admission and thereafter during hospital stay at 3 days interval. The organisms isolated were Staphylococci, E. coli, Pseudomonas, and Klebsiella, Bacteroides sp. and streptococci, out of which E. coli was found to be most common
Organism infecting patients in our study.

TABLE IX: SURGICAL PROCEDURE ON ADMISSION

SURGICAL PROCEDURE	NO.OF PATIENTS
Debridement	29
Debridement + Orchidectomy	3
Debridement + SPC	3

Regular cleaning and dressing with hydrogen peroxide and povidone iodine solution was done for all patients, until healthy granulation appeared. Out of 32 survived patients the following were the reconstructive procedures adopted:

TABLE X: RECONSTRUCTION AFTER WOUND HEALING

MODALITY OF RECONSTRUCTION	NO. OF PATIENTS	% OF PATIENTS
Healing and epithelialization without grafting	14	43.75
Secondary skin closure	11	34.37
Skin grafting	6	18.75
Testes placement in Medial thigh	1	3.13

FOURNIER'S GANGRENE SEVERITY INDEX SCORE

The mean FGSI score of all patients was **3.71** with std. deviation **± 3.46.**

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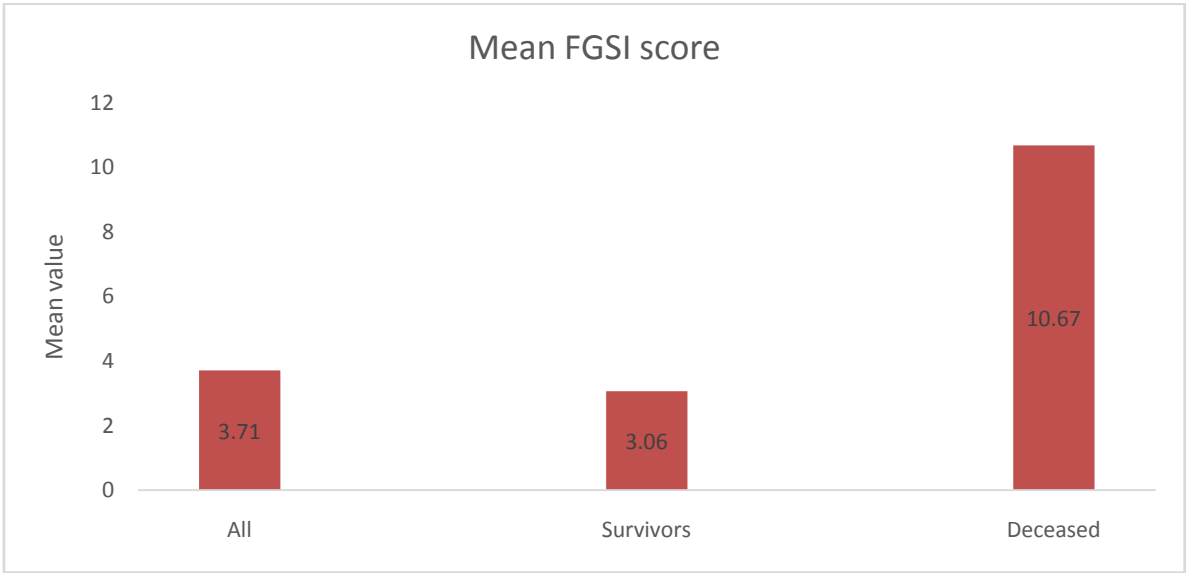
TABLE XI: MEAN FGSI SCORE OF SURVIVORS AND DECEASED.

MORTALITY	N	Mean FGSI score	Std.Dev.	T value	P-value
NO	32	3.06	2.816	4.5753	<0.0001
YES	3	10.67	1.514		

The score >10 predicting mortality was found to be statistically significant**. (p value <0.0001, significant)**

GRAPH VI:MEAN FGSI SCORE



III. Discussion

We have compared our study with study of: (1) Pushpendrakumar et al including 57 cases of Fournier's gangrene conducted in department of general surgery in S. S. Medical College, Rewa in 2016. (2) N. Eke et al[9] including 1726 cases of Fournier's gangrene conducted in Department of Surgery, at University of Port Harcourt, Nigeria, in 2000 and (3) Seracettin et al including 25 cases of Fournier's gangrene in Department of General Surgery, Istanbul, Turkey from 2012-2018.

TABLE XII: COMPARISION BETWEEN MEAN AGE (YEARS)

STUDY	MEAN AGE OF SURVIVORS	MEAN AGE OF DECEASED
Pushpendra Kumar et al	57.78	63.14
Seracettin et al	52.81	72.4
Our study	53.34	64.66

It was observed in their studies that subjects with **Age > 60** years had increased chances of mortality. In our study the mean age of survivors was 53.34 years and deceased were 64.66 years.

TABLE XIII: COMPARISION BETWEEN ETIOLOGIES

STUDY	COLORECTAL	UROGENITAL	DERMATOLOGIC
N.Eke et al	21%	19%	24%
Pushpendra et al	36.80%	24.5%	18%
Our study	23%	42.8%	11.4%

In our study maximum source of infection was found to be from urogenital source followed by colorectal and then dermatologic and 26% cases were found to have idiopathic cause.

TABLE XIV: SHOWING COMPARISION OF PATIENT OF DM

STUDY	DM (%)
N.Eke et al	20%
Pushpendra et al	84%
Our study	71%

N. Eke found diabetes as an independent risk factor. Pushpendra et al also found diabetes as an independent risk factor. Diabetes was found in about 71% of our cases so diabetes is an important risk factor in development of Fournier's gangrene.

TABLE XV: COMPARISION OF MEAN DURATION OF SYMPTOMS IN DAYS

STUDY	SURVIVORS	DECEASED
Pushpendra et al	4.28	6.85
Our study	3.75	4

Pushpendra et al found that duration of symptoms in his study in survivors were 4.28 days while deceased were 6.85 days. In our study we found that the mean duration of survivors were 3.75 days, and mean duration of symptoms of deceased were 4 days.

TABLE XVI: MEAN FGSI SCORE IN DIFFERENT STUDIES

STUDY	MEAN FGSI SCORE OF SURVIVORS	MEAN FGSI SCORE OF DECEASED
Pushpendra et al	4.21 ±4.3	8.4± 5.87
Seracettin et al	3.0 ± 1.8	12 ±2.4
Our study	3.06± 2.8	10.67±1.5

Pushpendra et al noted FGSI score as a significant mortality indicator and found it statistically significant. Seracettin et al also found FGSI score as an indicator of mortality. In all studies quoted above, FGSI score greater 9 was highly predictive of mortality. Mean FGSI score in deceased in our study is found to be 10.67, means an FGSI score >9 best predicted mortality in our study also and found to be statiscally significant. When first introduced in 1995 by Laor et al, studied in 30 patients, he found that the mean score of all non survivors was found to be 13.5. Subsequently in studies conducted by Yeniyol, Ulu, Cyzmet, Erol, Lujan [(10)] in 2004 in 25 cases. In all studies quoted above, FGSI score greater 9 was highly predictive of mortality.

IV. Conclusion

Fournier's gangrene is a notorious surgical emergency, in which patients present with myriad range of clinical presentations such as localized scrotal gangrene, involvement of perineum, perianal region or extensive involvement of anterior abdominal wall; all of which requires early diagnosis and treatment.Minor infection in predisposed individuals should be given due attention and should be treated promptly as negligence may lead to fatal complications. Imparting proper knowledge to such candidates is primary in helping them to seek proper medical and surgical care in order to prevent further mischievous and dreaded complicationsOnce diagnosed, early stabilization of hemodynamic vitality followed by early and quick debridement of the whole necrotic tissue in-toto under appropriate antibiotic coverage certainly aims to reduce further morbidity, thereby enhancing quality of life for the patients.

Presence of Diabetes, patients with advanced age, primary urogenital and colorectal sources of infection, delayed presentation above 48 hours, systemic sepsis on admission are generalized risk factors paving way further mortality in these patients.E. coli is found to be most common causative infectious agent leading to Fournier's Gangrene.FGSI score is a simple score based on vital parameters and basic lab tests. FGSI score greater than 9 should alert the surgeon to carry out immediate and extensive surgical debridement. This offers these patients a sure survival benefit, and helps us in prediction of morbidity and mortality of the patient.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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