

Clinicopathological Study of Necrotizing Fasciitis with Special Reference to Fournier's Gangrene: An Observational Study in a Tertiary Care Hospital, Eastern India

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Abstract

Original Research Article

Background: Fournier's gangrene is an acute, rapidly progressive, and potentially fatal, infective necrotizing fasciitis affecting the external genitalia, perineal or perianal regions, which commonly affect men, but can also occur in women and children. There has been an increase in number of cases in recent times. Despite advanced management mortality is still high and averages 20–30%. **Materials & Patients:** The present study was a hospital based prospective observational study conducted in the Department of Surgery, MGM Medical College and LSK Hospital, Kishanganj, Bihar. Over the period of two years, 50 cases of necrotizing fasciitis including Fournier's gangrene have been studied. Of these 50 cases, 12 cases presented in the emergency with local erythema and swelling with severe disproportionate pain to local signs and three with features of shock in addition to above symptoms. Culture and sensitivity test for pus and necroses tissue from the lesions of all patients were evaluated for aetiological organisms. Tissue biopsy was done for definitive diagnosis and also identify others concomitant pathological lesion, if any, necrosed tissue with healthy margin from the lesions of all 50 patients were evaluated. **Results:** The disease was most common between the aged 30 years and 60 years. The youngest patient in this series was 22 years old and the older years old. 38 patients were males and the remaining 12 were females, giving a female ratio of 3.17:1. Diabetes mellitus the most common pre-existing medical conditions in association with necrotizing fasciitis comprising 42% (total 21 cases) of which diabetes with peripheral vascular disease, diabetes with renal failure and diabetes with tuberculosis is accounts for 2% (1 case) for each respectively. Total number of tuberculosis is found in this study are 4 % (2). Between 21 cases of diabetes mellitus 16 are male (32%) and 5 are female (10%). Idiopathic factor is the most common predisposing factor and is account for 48% (24). Trauma was the next common whereas perianal abscess was third predisposing factor for necrotizing fasciitis. **Conclusion:** Early diagnosis using Laboratory Risk Indicator for Necrotizing Fasciitis score and stratification of patients into high risk category using Fournier's Gangrene Severity Index score help in early initiation of treatment. Triple antibiotic combined with radical debridement is the mainstay of treatment.

Keywords: Necrotizing fasciitis, Fournier's gangrene, Clinicopathology.**Copyright © 2019:** This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use (NonCommercial, or CC-BY-NC) provided the original author and source are credited.

INTRODUCTION

Necrotizing fasciitis including Fournier's gangrene is an uncommon, critically serious infection of the subcutaneous tissue and fascia with relative sparing of the skin and muscle, both of which may be infected secondarily [1]. Fournier gangrene is an extremely rare disease of the genitals. This disease is a result of the urogenital tract, anorectal area, and genital skin

infections, appearing usually in immunocompromised patients with diabetes, obesity, and malignant neoplasms [1]. Necrotizing fasciitis, commonly known as "flesh eating disease", is an infection of the subcutaneous tissue and deep fascia. It is a life threatening surgical emergency characterized by rapidly spreading necrosis of the subcutaneous fat and fascia with thrombosis of cutaneous micro-circulation [2, 3].

The term necrotizing fasciitis was first used in 1952 by Wilson and the most consistence feature of the infection, fascial necrosis [4]. Maloney's Synergistic Gangrene & Fournier's gangrene is all variants of similar disease process.

NF was defined by either histopathologic or surgical findings.⁵ Histopathologic evidence of NF included the presence of necrosis of superficial fascia (with or without polymorphonuclear infiltrates or bacteria) and edema of the reticular dermis, subcutaneous fat, and superficial fascia. In the absence of findings of pathologic examination of resected tissue, the diagnosis required characteristic surgical findings that included the presence of gray necrotic fascia with lack of resistance to blunt dissection, absence of bleeding during surgical dissection, and presence of foul-smelling "dishwater" pus at surgery in type I NF cases. In addition to the above criteria, the patient was also required to have moderate-to-severe sepsis judged to be secondary to necrotizing fasciitis.

Necrotizing fasciitis results from polymicrobial, synergistic infection most commonly a streptococcal species in combination Staphylococcus, E. coli, pseudomonas, proteus, bacteroids or clostridia [7]. It is common in old age, smoking, diabetic, immune suppressed, malnourished, obesity, and steroid therapy & HIV patients. Trauma is a common precipitating factor (80%). It can occur in limb, lower abdomen, groin, and perineum [7]. Necrotizing fasciitis is an uncommon disease with high morbidity and mortality rates.

Early symptoms (usually within 24 hours)[8]

- Usually a minor trauma or other skin opening has occurred (the wound does not necessarily appear infected)
- Some pain in the general area of the injury is present. Not necessarily at the site of the injury but in the same region or limb of the body
- The pain is usually disproportionate to the injury and may start as something akin to a muscle pull, but becomes more and more painful
- Flu like symptoms begin to occur, such as diarrhea, nausea, fever, confusion, dizziness, weakness, and general malaise

Dehydration

- The biggest symptom is all of these symptoms combined. In general you will probably feel worse than you've ever felt and not understand why.

Advanced symptoms (usually within 3–4 days) [8]

- The limb, or area of body experiencing pain begins to swell, and may show a purplish rash
- The limb may begin to have large, dark marks that will become blisters filled with blackish fluid

- The wound may actually begin to appear necrotic with a bluish, white, or dark, mottled, flaky appearance.

Critical symptoms (usually within 4–5 days)[8]

- Blood pressure will drop severely
- The body begins to go into septic shock from the toxins the bacteria are giving off
- Unconsciousness will occur as the body becomes too weak to fight off this infection.

MATERIALS AND METHODS

The present study was a hospital based prospective observational study conducted in the Department of Surgery, MGM Medical College and LSK Hospital, Kishanganj, Bihar. The study was approved by the Institutional Ethics Committee of Hospital and informed consent has been taken up when the case were seen. Over the period of these two years, 50 cases of necrotizing fasciitis including Fournier's gangrene have been studied. Of these 50 cases, 12 cases presented in the emergency with local erythema and swelling with severe disproportionate pain to local signs and three with features of shock in addition to above symptoms. Of the remaining 38 had been admitted in the Department General Surgery. All the patients were examined for signs and symptoms of disease on admission. A detailed history was taken and examination was done.

Investigations

Haematology: The haemoglobin level, total leucocytic count, differential leucocytic count, C-reactive protein and erythrocyte sedimentation rate were estimated in all cases.

Blood biochemistry: The blood sugar both fasting and post-prandial, blood urea, serum creatinine, liver function test especially serum albumin and lipid profile has been performed in every cases. In selective cases blood gas analysis, blood PH and serum cilium has been estimated.

Urine examination: Urine for routine and microscopic examination and also for culture sensitivity to detect source of infection for narcotising fasciitis

Chest X-ray: PA view chest was taken to detect any active pulmonary infection specially tuberculosis.

X-Ray of involved organ: presence of gas in the lesion; signify aetiological agents were gas organisms.

ELISA for HIV screening cases were sending to VCTC for HIV screening particularly who suspected to immune compromised. Gram staining of pus and

necroses tissue: It detects presence of gram positive and/or gram negative organisms.

Culture and sensitivity test: Pus and necroses tissue from the lesions of all patients were evaluated for aetiological organisms.

Tissue biopsy: This determined definitive diagnosis and also identify others concomitant pathological lesion, if any, necrosed tissue with healthy margin from the lesions of all 50 patients were evaluated.

Patients were taken to the operating room for surgical exploration of the fascia in the affected site, which was performed under local anaesthesia. The classic operative features of serosanguineous discharge, undermining of the skin, sparing of the underlying muscle as well as dull, oedematous, grey necrotic or gangrenous fascia confirmed the diagnosis of necrotizing fasciitis. Accordingly, a smear was sent for bacteriological evaluation and a full thickness skin biopsy was sent for histopathological evaluation (frozen section technique). Histologically, necrotizing fasciitis is characterized by obliterative endarteritis and thrombosis of the subcutaneous vessels; fascial necrosis, leukocytic infiltration with micro-abscess formation and absence of underlying muscle involvement.

Radical debridement was performed under general endotracheal anaesthesia and excised tissues were sent for histopathological evaluation. Multiple paraffin blocks were prepared from all excised material including the skin and/or muscle (if surgically excised); slides were prepared and stained with haematoxylin and eosin as well as Masson trichrome stains.

RESULTS

In this hospital based prospective observational study 50 cases who came to Surgery OPD. Of these 50 cases, 12 cases presented in the emergency with local erythema and swelling with severe disproportionate pain to local signs and three patient with features of shock in addition to above symptoms. Of the remaining 38 had been admitted in the Department of General Surgery, disease most common between 30 years and 60 years the total. So the disease was most common between the aged 30 years and 60 years. The youngest patient in this series was 22 years old and the older years old. 38 patients were males and the remaining 12 were females, giving a female ratio of 3.17:1 [Figure 1]. About 82% of cases found in people with poor socio economic status where as 10 % and 8% come from patient with good and medium economic status respectively [Figure 2].

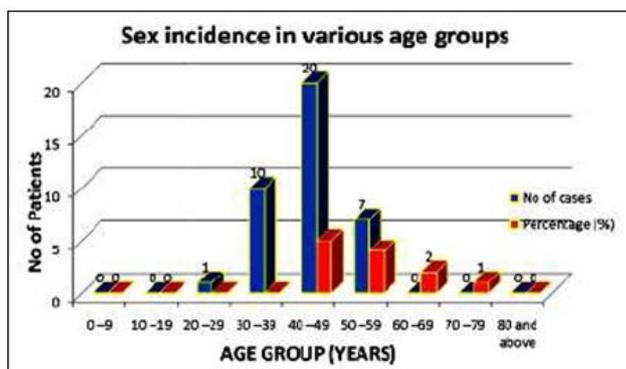


Fig-1: Incidence among male & female in different age groups

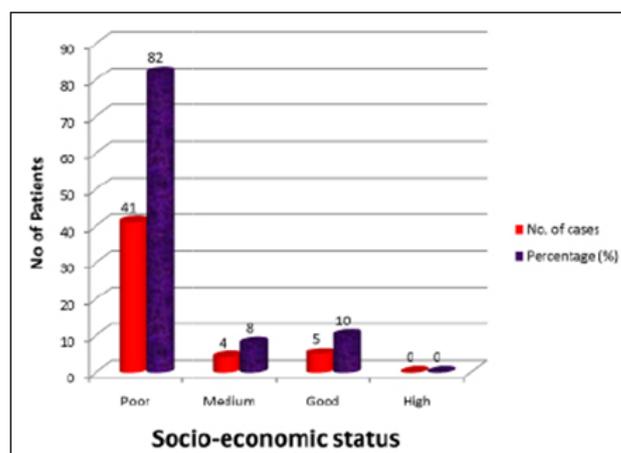


Fig-2: Socio economic status of the study participants

Low personal hygiene comprised 84% of cases of necrotizing fasciitis whereas 16% cases come from the persons with good person hygiene [Figure 3].

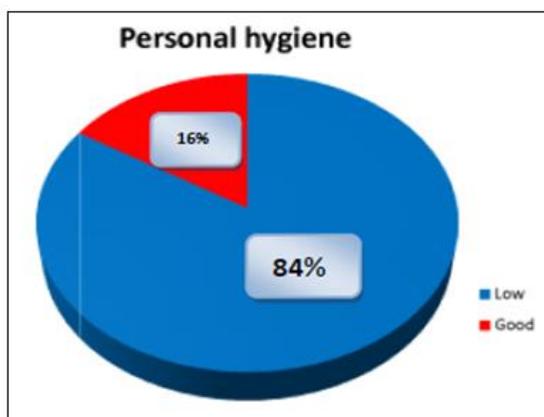


Fig-3: Impact of personal hygiene in disease process

Diabetes mellitus the most common pre-existing medical conditions in association with necrotizing fasciitis comprising 42% (total 21 cases) of which diabetes with peripheral vascular disease, diabetes with renal failure and diabetes with

tuberculosis is accounts for 2% (1 case) for each respectively. Total number of tuberculosis is found in this study are 4 % (2). Between 21 cases of diabetes mellitus 16 are male (32%) and 5 are female (10%) [Table 4, 5].

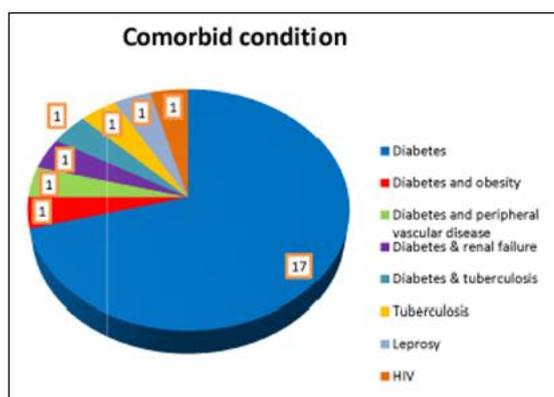


Fig-4: Associated comorbid conditions among necrotizing fasciitis patients

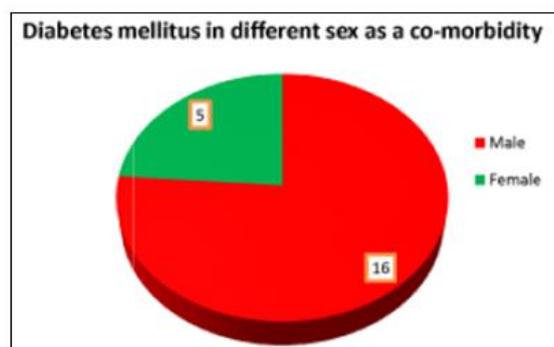


Fig-5: Diabetes mellitus in different sex as co-morbidity

Idiopathic factor is the most common predisposing factor and is account for 48% (24). Trauma was the next common whereas perianal abscess

was third predisposing factor for necrotizing fasciitis [Figure 6].

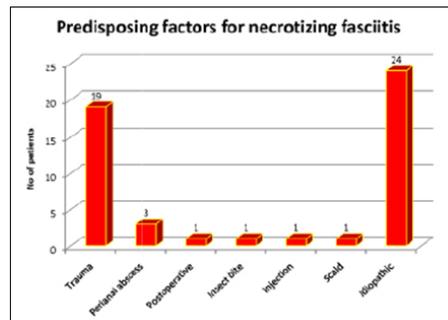


Fig-6: Predisposing factors for necrotizing fasciitis among study participants

DISCUSSION

In the present study disease most common observed between 30 years and 60 years the total. So the disease was most common between the aged 30 years and 60 years. The youngest patient in this series was 22 years old and the older years old. 38 patients were males and the remaining 12 were females, giving a female ratio of 3.17:1. Necrotizing fasciitis is commonly seen in middle age males [9, 10]. In our study about 82% of cases found in people with poor socio economic status where as 10 % and 8% come from patient with good and medium economic status respectively.

In Krieg A *et al.* [11] study, there were 8 women and 18 men with a mean age of 51.4 years \pm 14 (range 23 to 82 years). In our patient group twenty-four patients (92.3%) had a mean number of 2.54 \pm 1.4 (range 1-6) comorbidities. The most common comorbidities were diabetes, obesity, heart diseases, and nicotine-and/or alcohol-abuse. In Krieg A *et al.* [11] study the most common infection was a type I-polymicrobial infection with a prevalence of 53.8%. In 30.8% of our patients with type I infections, cultures grew also anaerobes.

In the present study low personal hygiene comprised 84% of cases of necrotizing fasciitis whereas 16% cases come from the persons with good person hygiene. Necrotizing fasciitis occurred in all ages from 15 to 85 years, mostly in patients over 40 years of age. The signs and symptoms of necrotizing fasciitis varied [12]. Cellulitis was present in all cases. Eleven patients (30%) had brown ecchymotic skin discolouration and 16 (59%) had cutaneous gangrene. The number of patients with skin gangrene was large due to misdiagnosis by the primary treating physician or late presentation of cases. Crepitation has been thought to be pathognomonic of clostridial infection. However, it is known that other organisms can create crepitation as does *E. coli* infection in diabetics. Four patients ((11%) had subcutaneous crepitation, and in one patient subcutaneous gas was demonstrated on CT scan, yet smear and cultures failed to grow clostridial organisms. The average temperature was 38.5 °C with a range of 37–40.5 °C and it was usually of a spiking or septic pattern [12].

In the present study diabetes mellitus the most common pre-existing medical conditions in association with necrotizing fasciitis comprising 42% (total 21 cases) of which diabetes with peripheral vascular disease, diabetes with renal failure and diabetes with tuberculosis is accounts for 2% (1 case) for each respectively. Total number of tuberculosis is found in this study are 4 % (2). Between 21 cases of diabetes mellitus 16 are male (32%) and 5 are female (10%).

Raafat Y. Afifi *et al.* [12] study showed all included patients presented with cellulitis. Oedema was present in 28 patients (75.6%), brown ecchymotic patches in 11 cases (30%), skin gangrene in 16 cases (59%), skin vesicles in five cases (13.5%), tenderness in four cases (11%) and crepitations in four cases (11%). The high incidence of skin gangrene was presumably due to delay in presentation from the patient side and delay in diagnosis and institution of therapy from the physician side, due to the difficulty in diagnosis and the lack of awareness of the condition and the proper way of setting up an early diagnosis [12]. In Krieg A *et al.* [11] study the most common infection was a type I-polymicrobial infection with a prevalence of 53.8%. In 30.8% of our patients with type I infections, cultures grew also anaerobes.

DM is the leading predisposing factor in both idiopathic and secondary NF in our patient population. The mechanisms that has been suggested how DM could cause susceptibility to NF are: a) the peripheral sensory polyneuropathy experienced by diabetics may increase susceptibility to minor trauma. b) Tissue hypoxia caused by diabetic vascular disease and the underlying immunodeficiency [13]. Even though there is substantial evidence indicating an important role of DM in the etiology of NF, its role as a predisposing factor for increased death rate is controversial. Some reports failed to show a significant relationship between mortality and DM in NF [14] interestingly, however, DM was determined as a significant factor associated with mortality in multivariate analysis in Taviloglu K *et al.* study.

Idiopathic factor is the most common predisposing factor and is account for 48% [8, 14]. In our study, trauma was the next common whereas

perianal abscess was third predisposing factor for necrotizing fasciitis.

In a study by Elliott *et al.* [14], it was found that the majority of monomicrobial infections were caused by streptococcal species like beta-haemolytic streptococci (namely, Group A streptococci or *Streptococcus pyogenes*). Other common monomicrobial necrotising soft tissue infections include *Staphylococcus aureus* and *Clostridium perfringens*. The organisms most common in polymicrobial necrotising soft tissue infections are combinations of staphylococci (*Staphylococcus epidermidis* with beta-haemolytic streptococci), enterococci, Enterobacteriaceae species (commonly *Escherichia coli*, *Proteus mirabilis*, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa*), streptococci, *Bacteroides/Prevotella* species, anaerobic Gram-positive cocci, and *Clostridium* species [15].

In our study scrotum and perineum was the commonest site involved. Other studies have shown similar results [3]. There may be a difference in the primary site of infection due to a difference in the hygiene level [3]. In case of perineum, male to female ratio is approximately 10:1[16]. Lower incidence in females may be caused by better drainage of the perineal region through vaginal secretions [16]. Some studies have shown the infection to be more common in the lower limbs [10].

CONCLUSION

Current study showed increased frequency of necrotizing fasciitis in people aged above 40 years. Diabetes mellitus other premorbid conditions increase the risk of mortality. The presence of erythema, swelling, bullous lesion and disproportional pain to local signs raised the suspicion of necrotizing fasciitis. Findings at surgical exploration and skin biopsy were the only reliable means of diagnosis. Polymicrobial infection in combination of *Escherichia Coli*, *Streptococcus*, *Pseudomonas*, *Bacteroids* and *Staphylococcus* were the most commonly found. Early debridement, parenteral combined antibiotic and supportive measure formed the basis of treatment. Septicaemia was a common complication which was often cause death.

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