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A prospective study of cases with necrotising fasciitis: our experience at a tertiary care teaching hospital

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ABSTRACT

Background: Necrotising fascitis is a life-threatening infection involving fascia and necrosis of subcutaneous tissue. The portal of entry usually is trivial trauma. It requires immediate diagnosis and intervention to reduce mortality. The objective of this study was to study clinical profile, predisposing risk factors and to formulate a protocol for management of necrotising fasciitis.

Methods: The study was conducted at tertiary care teaching hospital in Punjab, India catering to a semi-urban and rural (agricultural based) population over a period of three years between January 2014 to January 2017. All the consecutive patients who came to the emergency department (ER) of the institute presenting early with clinical features suggestive of NF were included in the study. The study included total 50 cases. The cases were studied in detail according to study plan that included age, sex, clinical features, results of blood and wound cultures, the number of surgical interventions, total duration of hospitalization and the mortality rate.

Results: The most common age group was between 40-60yrs and there were 48 males. There was history of trivial trauma or insect bite in majority of cases. Mostly patients presented with bullae formation, induration, edema. Diabetes was the commonest comorbid condition associated. All the patients were thoroughly investigated, swab cultures were taken. Debridements were done followed by grafting. In 10 patients, we could not salvage the limb and 10 patients expired after debridement.

Conclusions: Necrotising fasciitis is more common in middle aged males with diabetes. Early diagnosis and aggressive treatment is required to reduce the mortality.

Keywords: Diabetes, Necrotising fasciitis, Surgical debridement

INTRODUCTION

Necrotising fasciitis (NF) is also known as "flesh eating disease". It is an infection of deep fascia and subcutaneous tissue involving any part of body. The portal of entry usually is a trivial trauma or a surgical wound. However, no definitive cause can be found in upto 20-50% cases. Co-morbid conditions associated with necrotizing fasciitis are diabetes mellitus (31-44 %), obesity (28%), smoking (27%), alcohol abusers (17%), cirrhosis (8-15%), malignancy (3%), corticosteroid

therapy (3%) and chronic renal failure (3%).^{4,5} The documented incidence of NF in literature is reported to be low with 0.4 cases per 100,000 in the United Kingdom, but Indian scenario is not clear owing to paucity of literature in our setting.⁶

NF is a rare life-threatening condition characterized by rapidly spreading necrosis of the subcutaneous fat and fascia with thrombosis of cutaneous micro-circulation.⁷⁻⁹ Clinical symptoms consist of local symptoms like erythema, swelling, changes in skin colouring, intense

pain, bullae and sometimes subcutaneous emphysema and general symptoms such as fever, nausea, vomiting and malaise. NF is mainly classified into four types depending on causative organisms. In Type1 at least one anaerobic species is isolated with one or more facultative anaerobic streptococci (other than group A) and members of the *Enterobacteriaceae* (e.g., *E.coli, Enterobacter, Klebsiella, Proteus*). Type 2 is generally monomicrobial and caused by hemolytic *Streptococcus* group A. Type 1 is more common, with a relative reported incidence up to 75 %.^{1,4,10}

Early stages of disease are often misdiagnosed as cellulitis or abscess because of the absence of specific clinical features. Wong et all described the "Laboratory Risk Indicator for Necrotizing Fasciitis" (LRINEC) score, which is based on routinely performed laboratory tests. 11 They found that a score \geq 6 had a positive predictive value of 92% and a negative predictive value of 96%. However, this test has not been validated in larger, prospective studies.

The treatment of choice NF is early diagnosis and aggressive surgical debridement with supportive broadspectrum antibiotics. The purpose of this study was to study the aetiology, risk factors, clinical features and management of NF.

METHODS

This is a prospective study of 50 patients of necrotising fasciitis over a period of 3 yrs. The study was conducted in surgery department of a tertiary care teaching hospital in Punjab, India catering to a semi-urban and rural (agricultural based) population over a period of 3yrs between January 2014-January 2017.

All the consecutive patients who came to the emergency department (ER) of the institute presenting early with clinical features suggestive of NF were included in the study. The patients who presented late were not included. In total 50 patients were included in the present study. Diagnosis of NF was made by histo-pathologic examination of tissue samples or surgical findings. In addition, tissue samples were also sent to the microbiology section to isolate the causative organism.

Data was collected according to study plan that included age, sex, clinical features, results of blood and wound cultures, the number of surgical interventions, total duration of hospitalization and the mortality rate.

RESULTS

Of the total 50 patients who were included in the study; 48 (96%) were male and two were female. The most common age group (70 %) involved was 40-50 years and the least was less than 40 years (Table 1).

Table 1: Distribution of patients according to age and sex.

| A co cuoun | Emagnamari | Sex | |
|--------------|------------|------|--------|
| Age group | Frequency | Male | Female |
| <40 years | 4 | 08 | 0 |
| 41-59 years | 35 | 40 | 0 |
| >/= 60 years | 11 | 0 | 2 |

Table 2: Distribution of patients according to the site involved.

| Lower extremity | 34 |
|-----------------|----|
| Scrotum | 10 |
| Upper extremity | 4 |
| Face | 2 |

Table 3: Signs and symptoms.

| Erythema | 10 |
|---------------|----|
| Abscess | 10 |
| Bullae | 20 |
| Edema | 10 |
| Pain | 10 |
| Warmth | 20 |
| Induration | 20 |
| Skin necrosis | 10 |

Table 4: Various associated co - morbid conditions.

| Alcohol | 10 |
|----------------------|----|
| Diabetes | 20 |
| Alcohol and diabetes | 20 |

More than two-thirds (78%) of the patients presented with history of trivial trauma. The other common cause was post insect bite. When assessed clinically; most of the patients (40%) presented with warmth, induration and bullae formation of the involved organ. (20%) patients presented only with erythema, (20%) with abscess, (20%) with skin necrosis and (20%) patients complained only of pain. Lower extremity was commonly (68%) involved followed by scrotum (20%). Face was involved in (4%) (Table 2 and 3). Diabetes mellitus (40%) followed by alcohol abuse (20%) were the two commonest co-morbid conditions associated in our cases of NF. (40%) patients were suffering from diabetes mellitus and were chronic alcoholics (Table 4).

On microbiological cultures; the commonest organism isolated was *Escherechia coli* followed by beta haemolytic *Streptococcus* and *Staphylococcus aureus*.

After stabilization of patient in ER, the patients were taken up for debridement where necrotic tissue was excised and pus drained. In (10%) patients debridement was done within 6 hours. In (50%) of patients debridement was done in first 24 hours. (40%) patients

needed repeated debridement's. In 30 (60%) patients after regular dressings raw areas were covered with SSG. In 10 (20%) patients we had to amputate the limb. 10 (20%) patients suffered from septicaemia and multiorgan failure and we could not save them (Table 5).

Table 5: Various surgical procedures.

| Debridement and skin grafting | 30 |
|-------------------------------|----|
| Amputation | 10 |
| Debridement | 10 |

The total hospital stay ranged from 30 days - 45 days. Follow up ranged from 2 months to 2 years.



Figure 1: (A) Preoperative picture of patient with necrotising fasciitis involving left eye; (B) Post-operative picture after debridement of wound; (C) Post-operative picture after split skin grafting; (D) Late post-operative picture of the same patient.



Figure 2: (A) Preoperative picture of patient with necrotising fasciitis involving right lower limb; (B) Late post-operative picture showing well settled graft.

DISCUSSION

Necrotising fasciitis has been recognized for centuries dating back to Hippocrates in the 5th century BC.⁷ It was

first described as "hospital gangrene" in 1871 by confederate Army surgeon Joseph Jones during the American civil war and then as 'haemolytic streptococcal gangrene' by Meleny. ¹² A fulminating genital gangrene affecting healthy men was described by Fournier in 1883 and he named the process 'idiopathic gangrene of the scrotum'. ¹³ The term necrotising fasciitis was used by Wilson In 1952 to describe the same disease in other parts of the body. ¹⁴ NF commonly known as 'flesh eating disease' and is rapidly progressive characterized by extensive necrosis of subcutaneous fat and fascia. ¹⁵

Secondary necrosis of the overlying skin is common but generally underlying muscle is spared. The most common sites involved are perineum and lower extremity. The comorbid factors associated with necrotising factors include diabetes, chronic alcoholism, drug abuse, corticosteroid immune-suppression, malignancy, peripheral vascular disease.1 In our study the most common age involved is middle age which is in correlation with other studies.^{7-9,16,17} Males were more involved, the reason could be males are more involved in outdoor activities. In our study diabetes was the commonest co-morbid condition associated which is in correlation with other studies in literature. 15 Higher blood sugar in these patients produce a good medium for bacterial growth and predisposes to an environment of low oxygen tension and rich substrate for bacterial growth. Diabetes also cause defective phagocytosis, decreased cellular immunity and micro-vascular disease with resultant ischaemia. 18,19

The patients with necrotising fasciitis can present with erythema, swelling, pain, induration, discharge, bullae formation and warmth. In our study, the patients commonly presented with warmth, induration and bullae formation (40%). Trivial trauma was the commonest cause. In our study, lower extremity (68%) was commonly affected followed by perineum. This was in consistent with study by Jeyaraman et al, where lower extremity was involved in 77% of cases followed by perineum in 20% of cases.²⁰

The pus was sent for culture and sensitivity in all the cases. The commonest organism was *E.Coli*, followed by *Streptococcus* and *Staphylococcus*. This is in correlation with other studies in literature. The mainstay of treatment of necrotising fasciitis is rapid surgical debridement followed by appropriate antibiotic therapy after initial resuscitation with fluid and electrolyte replacement/blood transfusion. The case of the case

According to Wipf et al, the single most important determinant of survival is the amount of time elapsed between initial presentation and surgical debridement.²¹ In a retrospective review of 68 patients, Bilton et al, reported 4.2% mortality for patients undergoing early surgical debridement and 38% mortality for those with delayed treatment.²²

In our study, all the patients were taken for debridement. Aggressive surgical debridements were done, all necrotic tissues were removed till fresh bleeding. No wound was closed after first debridement. Patients were kept on daily dressing till the wound was covered with healthy granulation tissue. Re-debridements were done whenever required. We observed 20% mortality in our patients due to septicaemia. NF mortality rate as per Evangelos et al is about 32%. ²³ In the literature mortality in NF varies from 3.7%-46%. The mortality increases with delay in treatment. ²⁴ In this study, we covered raw areas with skin graft when there was healthy granulation tissue in 30 patients. The hospital stay ranged between 30-45 days. The follow up ranged between 2 months to 2 years.

CONCLUSION

NF is a lethal soft tissue infection commonly involving middle aged males with diabetes being the commonest co-morbid condition. Lower extremity is the most common site affected. Most infections are polymicrobial with *E.Coli* being the most common bacteria isolated. Early and aggressive surgical debridements often at repeated sittings are the mainstay in the treatment of NF, supplemented by adequate antibiotics and supportive measures.

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