Original Article

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Clinico - Microbiological Profile of Necrotizing Fasciitis in a Tertiary Care Hospital

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Abstract

Introduction: Necrotizing fasciitis (NF) is a rare, rapidly progressive inflammatory infection of the fascia, with secondary necrosis of subcutaneous tissues. It is a surgical emergency which requires high degree of suspicion, early diagnosis, and treatment to reduce disease-associated morbidity and mortality.

Aim: This retrospective study was done to analyze NF; its clinical presentation, predisposing factors, and microbiological characteristics. This study also emphasizes on surgical management and prognosis of this condition.

Methodology: This is a retrospective study which included all the 30 patients admitted and treated for NF in Victoria hospital, Bengaluru between July 1, 2014 and June 30, 2015.

Results: There were 30 patients admitted and treated with NF during the study period. The mean age of occurrence was 48 years, who were predominantly male agriculturists. Most common site affected was calf. Various risk factors were identified with the major contributor being diabetes mellitus and main etiology being soft tissue infection. The patients presented with an array of physical findings, with tenderness present in almost all patients. Microbiologically half of the culture yielded growth, with polymicrobial being the most common type isolating *Pseudomonas*, *Staphylococcus*, *Klebsiell*a as organisms causing it. Mono microbial cultures mainly yielded *Escherichia coli* and *Streptococcus*. The majority of them responded well to antibiotics and surgical debridement with few patients needing amputation, all being diabetics. The mortality rate in our study was 13.3%.

Key words: Culture, Diabetes mellitus, Necrotizing fasciitis, Surgical debridement

INTRODUCTION

Necrotizing fasciitis (NF) is a rapidly spreading, inflammatory infection of the deep fascia, associated with secondary necrotic changes of subcutaneous tissue.[1] It is perhaps the most aggressive form of necrotizing soft tissue infection[2] and can spread rapidly to entire limb within hours.[3]

The first description of NF was given in the fifth century B.C by Hippocrates.[4] In 1921, Wilson coined the term "NF" which aptly describes its pathologic process.[5] Many other terminologies are used to describe same disease process such as Fournier's gangrene (perineum), phagedena gangrene, bacterial synergistic gangrene, and Meleney's gangrene (abdominal wall).

At the initial stages of presentation, it has a paucity of clinical signs and is difficult to differentiate it from cellulitis. A high index of suspicion is needed to diagnose it.

According to the microbiological characteristics, NF is classified into Type 1 (synergistic polymicrobial infections including anaerobes) and Type 2 (mono microbial infections), the former being more common.[6,7] The most common mono microbial infection causing organisms include Beta-hemolytic *Streptococcus*, *Staphylococcus aureus*, and *Clostridial* species. Common polymicrobial synergistic infection causing organisms includes *S. aureus*, *Staphylococcus pyogenes*, *Enterococci* species, *Escherichia coli*, *Pseudomonas* species, and anaerobic organisms such as *Bacteroides*.[8,9]

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The Precise pathogenesis of NF is unclear. Inoculation of microbes can occur through minor trauma, snake or insect bite, surgical incisions, etc., Under favorable environmental conditions such as immune compromised states, liver failure, renal failure, and diabetes organisms multiply to cause disease process. It can occur in any part of the body, but more commonly in some anatomic areas such as extremities, abdomen, groin, and perineum.

NF first starts in deep tissue plane, so superficial skin signs may not be evident initially. This usually leads to a delayed diagnosis of this condition. Many patients present with toxic features due to sepsis without any underlying signs. Later, they may develop edema, tenderness, vesicle, bullae, and crepitus.

This condition is usually diagnosed by clinical features, but other investigations may help to confirm it. Plain X-ray may show subcutaneous gas. Computed tomography scan and magnetic resonance image may show asymmetrical fascial thickening, fat stranding, and gas tracking along fascial planes. Tissue biopsy is the diagnostic test which reveals necrosis, polymorph nuclear infiltration and thrombosis of vessels.

The management includes initial resuscitation, supportive care, adequate control of risk factors such as blood sugars; intravenous antibiotics, extensive debridement, and occasionally radical procedures such as amputations.

The mortality rates of this disease have remained alarmingly high with reported mortality rates ranging from 6% to 76%.[10] Multiple studies have shown that delay in the diagnosis and consequently delayed operative debridement which has caused increase in the mortality.[11]

The purpose of this study is to analyze NF, its clinical presentation, predisposing factors, and microbiological characteristics. This study also emphasizes on surgical management and prognosis of this rare surgical emergency.

METHODOLOGY

The authors conducted a retrospective study that included the 30 patients admitted and treated at Victoria hospital, Bengaluru between July 1, 2014 and June 30, 2015 for NF. Only those patients with diagnosis confirmed by histopathological examination were included in the study.

Clinical microbiological profile of the patient was studied with respect to age, sex, clinical features, site/location of infection, risk factors, etiological factors, microbiological characteristics, and the treatment outcome.

RESULTS

The minimum age of appearance of NF was 22 years, and the maximum being 84 years (mean age = 48).

There were 28 males (93.3%) and only 2 females (6.7%). About 66.6% of the people were agriculturists by occupation.

The majority of the patients had involvement of calf region (70%). The various sites affected are shown in Table 1.

Among the risk factors Type 2 diabetes mellitus was present in 21 (70%) cases. Totally, 8 (26.6%) had hypertension, 3 (10%) had renal failure, HIV positive status in two (6.6%) patients. In 8 (26.6%) patients, no risk factor could be identified and 6 (20%) were aged more than 60 years.

Figure 1 bar diagram shows the risk factors associated with NF.

Etiological factors were soft tissue infection in 16 (53.3%), trauma in 8 (26.6%), snake bite in 2 (6.7%), post-operative status 2 (6.7%), and unknown etiology in 2 (6.7%).

Figure 2 pie chart shows the different etiological factors of NF.

Table 1: Different sites of involvement of necrotizing fasciitis

Lower limb	
Foot	1
Calf	21
Thigh	2
Foot+calf	1
Calf+thigh	1
Upper limb	2
Abdomen	2

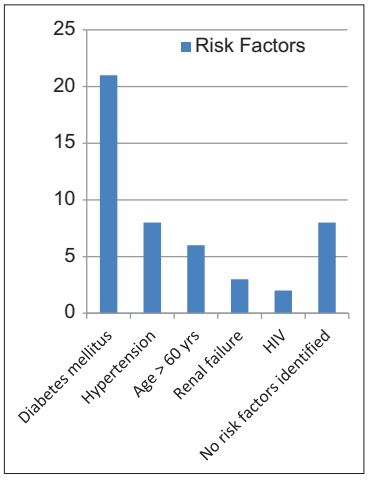

Figure 1: Various risk factors associated with necrotizing fasciitis

Physical findings were varied. Tenderness was the most common and was seen in 28 patients (97.9%), followed by edema in 26 (91.5%), erythema 15(50%), skin vesicles/bullae 5 (16.6%), soft tissue crepitus 10 (33.3%), hypotension 6 (20%), fever 8 (26.6%), tachycardia 16 (53.2%), and altered mental status 4 (13.3%).

Figure 3 bar diagram is showing an array of physical findings.

After culture 15 (50%) showed no growth and 15 (50%) showed growth. 40% mono microbial and 60% were polymicrobial (Figure 4). Of all the cultures, 80% were aerobic, 6.6% anaerobic and 13.3% mixed. The most common organism isolated was *Pseudomonas aeruginosa* (33%) followed by *S. aureus* (20%) and *Klebsiella* (13.3%) in poly microbial culture. Beta-hemolytic *Streptococcus* and *E. coli* were found to be the important cause of mono microbial infection (40%) in NF.

Figure 4 pie diagram is showing culture growth patterns.

Mean number of surgical debridement was 2.5. Amputation was done in 3 patients (10%) with two below knee amputation, one above knee and all were diabetic.

4 (13.3%) patients died, 26 (87.7%) recovered.

DISCUSSION

NF is a rapidly spreading infection involving the skin, superficial fascia, and subcutaneous fat. It is a surgical emergency that requires a high degree of suspicion, early diagnosis, and aggressive debridement to prevent sepsis and mortality. The mortality rate in our study was 13.3% which is lower when compared to other literature.[6,12]

NF has affected wide age group, but the mean age of presentation was 48 years with most of them being male and with agriculture as their occupation. The most common site of involvement was the calf.

Above results can be explained by the fact that it commonly affects the working age group who are barefoot walkers, frequently encountering trauma to exposed parts, especially lower limbs. There are various risk factors which predisposes to this condition such as diabetes, hypertension, HIV status, and chronic renal failure among which diabetes was the most common risk,[13] which was present in more than two-third of the patients. Above finding was consistent with other studies. Increased blood sugars predispose to the environment of low oxygen tension and acts as a good substitute for bacterial growth. Etiological factors included soft tissue infections, trauma, snake bite, postoperative

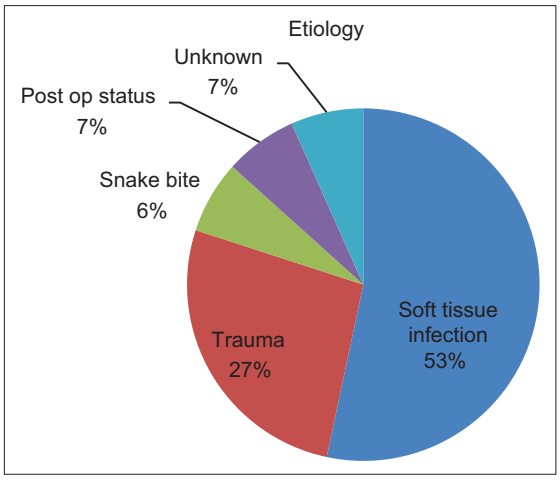

Figure 2: Various etiology for necrotizing fasciitis

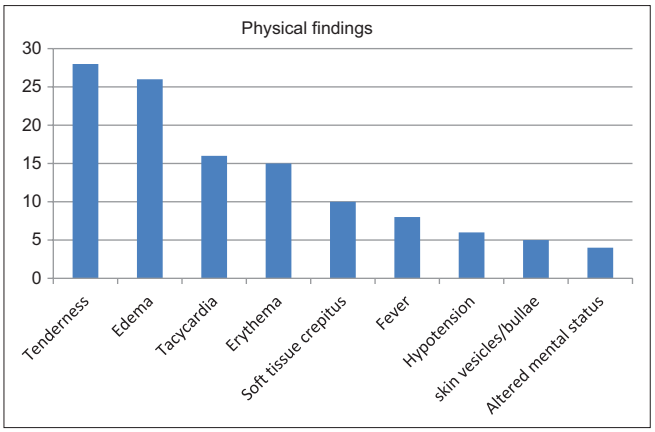

Figure 3: Various physical findings in cases of necrotizing fasciitis

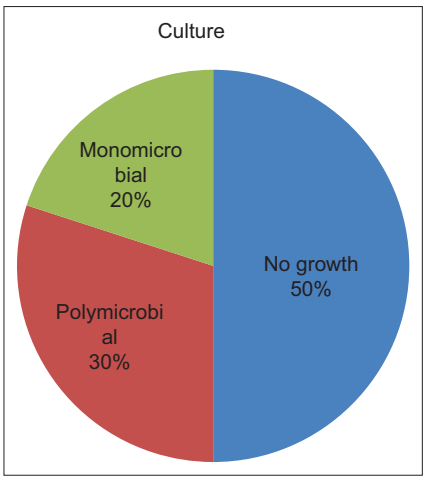

Figure 4: Culture growth pattern

status, with soft tissue infection being the prime cause. Above observation can be explained by the fact that most of them presented and were admitted as cellulitis in whom later involved deeper tissues, in diagnose later as NF. The patients presented with a wide range of clinical features

such as tenderness, edema, erythema, skin vesicle/bullae, soft tissue crepitus, hypotension, fever, tachycardia, and altered mental status in decreasing order of their frequency. In our study, tenderness and edema were the consistent physical findings, which suggest that these may be the early signs of NF. Soft tissue crepitus, which is the characteristic finding, was an inconsistent presentation seen in only 33.3% of the patients.

In our study, 50% of cultures yielded growth, out of which polymicrobial was the leading cause. The most common organism isolated was *P. aeruginosa*, followed by *S. aureus* and Klebsiella. Beta-hemolytic *Streptococcus* and *E. coli* were found to be the important cause of mono microbial infection.

Most of the patients recovered with appropriate antibiotics and surgical debridement, with 10% requiring amputation, all of them being diabetic, which suggests the aggressiveness of this disease in diabetics.

CONCLUSION

NF is relatively rare but dreaded surgical emergency. Arriving at the diagnosis is one of the challenging tasks in treating patients, which requires a high index of suspicion. The outcome is influenced by prompt early diagnosis, the timing and extent of surgical debridement and even radical procedures such as amputation, when necessary to prevent mortality.

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