

ORIGINAL ARTICLE

RISK FACTORS FOR NECROTIZING FASCIITIS AND ITS OUTCOME
AT A TERTIARY CARE CENTRE

Yogendra Gupta, Manisha Chhetry*, Kamal Raj Pathak**, Ranjib Kumar Jha, Nischal Ghimire, Bibhuti Nath Mishra, Navin Kumar Karn, Ganesh Kumar Singh***, Jatindra Nath Bhagabati**

Department of Orthopaedics and Trauma, *Department of Obstetrics and Gynaecology, **Department of General Surgery, ***Department of Microbiology, Nobel Medical College Teaching Hospital and Research Centre, Biratnagar-Nepal

Background: Necrotizing fasciitis (NF) is a serious and potentially fatal condition where there is rapid progression of inflammation of skin, subcutaneous tissue, and superficial fascia and can be mono-microbial or poly-microbial. The disease is rapidly progressive in nature and if not promptly treated leads to significant morbidity or even mortality. This study was designed to explore the various risk factors commonly present and study the outcome of the disease. **Methods:** This was a cross sectional study done in tertiary centre over period of one year from April 2014 to March 2015. Patient admitted with soft tissue infection were presumptively made diagnosis of NF based on clinical features and final diagnosis was made after pre-operative surgical findings. **Results:** Forty two (40.38%) patients had final diagnosis of NF out of 102 soft tissue infections. Twenty-nine (69%) of 42 patients with NF fully recovered with surgical and medical management. Eleven (26.2%) of these patients succumbed to their illness and two (4.8%) needed amputation of limb to control the infection. The most common co-morbid condition was alcoholism, followed by diabetes mellitus. **Conclusion:** The incidence of necrotizing fasciitis in patients admitted with soft tissue infection was 40.38%. Mortality and morbidity due to this condition was found to be high.

Keywords: necrotizing fasciitis; outcome; mortality; morbidity

J Ayub Med Coll Abbottabad 2016;28(4):680–2

INTRODUCTION

Necrotizing fasciitis (NF) is a serious and potentially fatal condition where there is rapid progression of inflammation of skin, subcutaneous tissue, and superficial fascia. It can be poly-microbial, usually seen in patients with poor immune system, malignancies or those who have undergone recent surgeries and the common organisms being *E.coli*, *Pseudomonas* species, *Vibrio* species etc. or mono-microbial usually due to group A beta haemolytic streptococcus alone or with other species like *Staphylococcus aureus*. The risk factors for this variety being intravenous drug abuse, injuries, surgery, young age, delivery, trauma or burns.^{1,2}

The commonly involved sites include limbs, perineum, genitalia, abdomen and head and neck region. The disease is rapidly progressive in nature and if not promptly treated leads to significant morbidity or even mortality. Therefore, early recognition, radical debridement, use of appropriate antibiotics with identification and control of the risk factors is necessary.^{3,4} Hence we designed this study to explore the various risk factors commonly present and study the outcome of the disease.

MATERIAL AND METHODS

This was a cross sectional study in which all patients admitted with the final diagnosis of necrotizing fasciitis at Nobel Medical College and Teaching

hospital in the department of general surgery; orthopaedics and trauma and gynaecology and Obstetrics and meeting the criteria for diagnosis of necrotizing fasciitis, over a period of one year (from April 2014 to March 2015) and who completed the treatment were included and the various risk factors and outcome studied. The presumptive diagnoses was made initially clinically based on particular historical predisposing factors, increased pain over an area with associated skin changes(vesicles, crepitus, necrotic patches), oedema extending beyond the area of erythema and absence of lymphangitis. These local findings were supported by various degrees of systemic features depending upon the area of involvement and delay in presentation to hospital. The final diagnosis was made on the basis of operative findings. The presence of greyish necrotic fascia, no bleeding from fascia on dissection, absence of resistance that is present in normally adherent superficial fascia and the presence of 'dishwater' pus are the findings observed during operation

Patients who received antibiotic treatment in the last 48 hours or a minimum of three doses of antibiotic prior to presentation with signs of improvement clinically, those already managed surgically or those with boils or furuncles with no evidence of cellulitis or those who left against medical advice before completion of treatment were excluded from the study. Collected data was analysed

using SPSS-21. Descriptive statistics (frequency, percentage, mean, standard deviation) were used to describe the data set.

RESULTS

We had 104 patients presenting with the infection of soft tissue over a period of one year and out of these, 42 (40.38%) patients had final diagnosis of NF and 62 were non-necrotizing soft tissue infections.

The mean age of the study participants diagnosed of NF was 51.48 years, the age range was 19–92 years. Sixty nine percent of the patients with NF were male. The most common co-morbid condition was alcoholism, followed by diabetes mellitus.

Forty three percent of the cases with NF did not have any significant co-morbidity (Table-1). Out of 42 patients of necrotizing fasciitis, majority (45.2%, n=19/42) had multiple organisms in their wound culture while 14.3% (n=6/42) of them had sterile culture. *Staphylococcus aureus* was most common organism (27.7%, n=18/42) isolated in patients with necrotizing fasciitis followed by *Streptococcus* in 16.9% (11) and *Enterococcus* 15.4%. Twenty-nine (69%) of 42 patients with NF fully recovered with surgical and medical management. Eleven (26.2%) of these patients succumbed to their illness and two (4.8%) needed amputation of limb to control the infection (Table-2).

The extremities (66.6%) were the most common site of involvement with lower limbs constituting 54.4% of the total cases. It was followed by perineum and scrotum (23.8%) of cases.

Twenty-five (67.6%) patients with single site NF improved, two (5.4%) needed amputation while ten (27%) died while four (80%) patients in the multiple site group improved and it was not statistically significant (0.798). Most patients who improved had infection in the upper limb (55.17%) whereas maximum mortality was seen in necrotizing fasciitis of the lower limb (81.82%) (Table-3).

Table-1: Co-morbidities present in the patients

Co-morbidity	No. of patients	Percentage
Alcoholism	9	21.4
Diabetes mellitus	7	16.7
Renal disease	1	2.4
Diabetes and alcoholism	3	7.1
Renal disease and alcoholism	1	2.4
Intravenous drug abuse	1	2.4
Liver disease & alcoholism	1	2.4
Diabetes, liver disease, renal disease, anaemia	1	2.4
No co-morbidities	18	42.9

Table-2: Outcome of the patients

Outcome	No of patients	percentage
Improved	29	69
Amputation	2	4.8
Mortality	11	26.2

Table-3: Sites of NF and outcome

Sites	Improved	Amputation	Mortality	p-value
Upper limb	16	1	2	0.572
Lower limb	12	1	9	
Perineum	1	0	0	

DISCUSSION

Necrotizing fasciitis has unpredictable outcome. The final outcome is determined by the interplay of various factors, though the contribution of one or two factors may be more prominent as compared to others. The broad categories under which the risk factors can be grouped include factors related to patients, disease related and those related to treatment.

Factors related to patients include age, sex and the presence of co-morbid conditions. The mean age of the patient suffering from NF in our study was 51.48. In most of the studies this condition was found to be more common in the elderly.⁵ Of 42 patients of NF 29 of them were male which made up 69% of the cases. Similar result was seen in other studies.⁶⁻⁸

In the study by Wong *et al* in Singapore, the most common co-morbidity was diabetes mellitus, which was seen in 71% of the studied population.³ Patient with the history of alcoholism in same study was only 3% but peripheral vascular disease was present in 23% of the patients.

However, in the study done by Park *et al* 217 patients, diabetes mellitus accounted for only 15.2% of the cases and alcoholism was present in 53.5%.⁹ The present study in contrast to this study, 26.2% of the patients had diabetes mellitus and 33.3% were regular alcohol consumers. 42.9% of the cases of NF did not have any known co-morbidity.

Disease related risk factors include delay in presentation, site of involvement, and presence of mono-microbial or poly-microbial infection and the antibiotic sensitivity of the organism.

In this study, the growth of bacteria from the culture of discharge was found in 36 of 42 cases of which there were two or more organisms in 19 cases (52.7%). Seventeen patients had single organism in the culture of their discharge. Most common organism was *Staphylococcus aureus*, which was isolated from 18 (27.7%) cases. *Streptococcus*, *Enterococcus*, *E. coli* and *Actinobacter* was isolated in 11, 10, 8 and 4 cases respectively. *Pseudomonas* was found in 3 cases whereas *Proteus* and *Citrobacter* were found in 2 cases each. *Klebsiella* was isolated in a single case and 6 showed no growth. These findings were similar to the findings of the study done by Brook *et al* 375 organisms were isolated from 81 of 83

patients of NF.¹⁰ Out of these only 105 were aerobes with predominance of *Staphylococcus aureus*, Group A *Streptococci* and *Escherichia coli*. The outcome of the disease depends upon all these factors. We could not analyse the time delay in presentation. Reliable data couldn't be obtained. The analysis of sites of involvement and mortality show higher mortality in lower limbs but the result is insignificant.

Larger number of cases of lower limbs in this study may be the obvious cause. The mortality outcome is comparable to the study done by Wong *et al* in 89 patients and Elliot *et al* in 198 patients of NF, which was 21% and 19.2% respectively.^{3,5} The amputation rate in our study was lower in comparison to these two studies where it was 23% and 27.8% respectively. This may be because this study was a prospective one while those two were retrospective which might have influenced the aggressive nature of the management required in these cases.

Factors related to treatment include two stage of the disease process. The initial stage is surgical emergency. The large amount of necrotic tissue fuels a persistent septic state and recalcitrant hemodynamic instability. Aggressive resuscitative efforts along with wide debridement of necrotic and poorly perfused tissues and broad spectrum antibiotics covering both aerobes and anaerobes lead to more rapid overall clinical improvement. All the patients were managed on this principal though some delay may have led to a fatal outcome in these rapidly progressive conditions. Frequent wound examinations and serial debridement were done to halt the disease process.

The second stage starts after the patient has been stabilized and includes soft-tissue reconstruction. No patient in our study died after the initial stage was over. Various methods of soft tissue were used for the wound coverage. Two patients with amputation were later given prosthesis.

CONCLUSIONS

The incidence of necrotizing fasciitis in patients admitted with soft tissue infection was 40.38% with the mean duration of hospital stay being 31.74 days. *Staphylococcus aureus* was the most common organism isolated (27.7%). Mortality and morbidity due to this condition was found to be high.

AUTHORS' CONTRIBUTION

All authors contributed in data collection. MC and KRP did data analysis. Preliminary draft was prepared by YG, GKS and RKJ with valuable inputs added on by NG, BNM, NK and JNB. All authors finally approved the final manuscript before submission.

REFERENCES

1. Anaya DA, Dellinger EP. Necrotizing soft-tissue infection: diagnosis and management. *Clin Infect Dis* 2007;44(5):705–10.
2. Miller LG, Perdreau-Remington F, Rieg G, Mehdi S, Perloth J, Bayer AS, *et al*. Necrotizing fasciitis caused by community-associated methicillin-resistant *Staphylococcus aureus* in Los Angeles. *N Engl J Med* 2005;352(14):1445–53.
3. Wong CH, Chang HC, Pasupathy S, Khin LW, Tan JL, Low CO. Necrotizing fasciitis: clinical presentation, microbiology, and determinants of mortality. *J Bone Joint Surg Am* 2003;85(8):1454–60.
4. Headley AJ. Necrotizing soft tissue infections: a primary care review. *Am Fam Physician* 2003;68(2):323–8.
5. Elliott DC, Kufera JA, Myers RA. Necrotizing soft tissue infections. Risk factors for mortality and strategies for management. *Ann Surg* 1996;224(5):672–83.
6. Singh G, Sinha SK, Adhikary S, Babu KS, Ray P, Khanna SK. Necrotising infections of soft tissues—a clinical profile. *Eur J Surg* 2002;168(6):366–71.
7. Hsiao CT, Weng HH, Yuan YD, Chen CT, Chen IC. Predictors of mortality in patients with necrotizing fasciitis. *Am J Emerg Med* 2008;26(2):170–5.
8. Huang KF, Hung MH, Lin YS, Lu CL, Liu C, Chen CC, *et al*. Independent predictors of mortality for necrotizing fasciitis: a retrospective analysis in a single institution. *J Trauma* 2011;71(2):467–73.
9. Park KH, Jung SI, Jung YS, Shin JH, Hwang JH. Marine bacteria as a leading cause of necrotizing fasciitis in coastal areas of South Korea. *Am J Trop Med Hyg* 2009;80(4):646–50.
10. Brook I, Frazier EH. Clinical and microbiological features of necrotizing fasciitis. *J Clin Microbiol* 1995;33(9):2382–7.

Received: 5 April, 2016

Revised: 22 May, 2016

Accepted: 28 June, 2016

Yogendra Gupta, Department of Orthopaedics and Trauma, Department of Obstetrics and Gynaecology, Nobel Medical College Teaching Hospital and Research Centre, Biratnagar-Nepal

Cell: +977-9849693207

Email: doc_yogendra@yahoo.com