



Diabetes Mellitus: A Predisposing Factor of Necrotising Fasciitis

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ABSTRACT

Necrotizing fasciitis with secondary necrosis of the subcutaneous tissues is a rapidly progressive inflammatory infection of the fascia. The propagation velocity is directly proportional to the thickness of the subcutaneous layer. Necrotizing fasciitis travels around the plane of the fascia. These are primarily two types, i.e., respectively, mono microbial and poly microbial infections. The most common comorbidity associated with necrotizing fasciitis is diabetes mellitus. Up to 44.5 percent of patients with this disorder are diabetic. Diabetes patients normally have a type I poly microbial disease. Diabetic patients who, due to poor immunity, are more vulnerable to such an infection. Diabetic patients show delayed healing of cutaneous wounds and increased susceptibility to infection.

Keywords: Diabetes mellitus, Necrotising fasciitis, Poly microbial infection, Mono microbial infection.

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- Age > 60 years
- Intravenous drug misuse

Necrotizing fasciitis is usually a rapidly occurring acute phase over many days. In about 80 percent of all cases, it is a direct sequela of bacterial infection introduced by a break in the integrity of the skin. For the majority of these single-site source infections, Gram-positive cocci, specifically strains of *Staphylococcus aureus* and *Streptococci*, are responsible. Due to a mixture of gram-negative and anaerobic participation, polymicrobial infections also occur.^{5,6}

The most common comorbidity associated with necrotizing fasciitis is diabetes mellitus. Up to 44.5 percent of patients with this disorder are diabetic. Diabetes patients typically have polymicrobial type I disease and have worse outcomes, with a higher amputation rate relative to non-diabetics.⁷ Diabetic patients who are more vulnerable to such an infection by poor immunity.⁸ Patients with diabetes have reduced cutaneous function. Healing of wounds and increased infection resistance, which may affect the path of infections of soft tissue.⁹ In order to perform tissue debridement and start a broad-spectrum antibiotic cover, surgical referral should be made as early as possible, both steps being necessary to reduce morbidity and mortality rates.¹⁰

As an empirical therapy, broad-spectrum antibiotic combinations against gram-negative, gram-positive bacilli and anaerobes should be used. Among the many choices are vancomycin, linezolid, or daptomycin combined with one of the following: either piperacillin-tazobactam or a carbapenem or ceftriaxone plus metronidazole, or a fluoroquinolone plus metronidazole.^{11,12}

INTRODUCTION

Necrotizing fasciitis with secondary necrosis of the subcutaneous tissues is a rapidly progressive inflammatory infection of the fascia. The propagation velocity is directly proportional to the thickness of the subcutaneous layer. Necrotizing fasciitis travels around the plane of the fascia.^{1,2,3}—Aerobic, anaerobic, or mixed flora can be the causative bacteria.⁴ A few different syndromes of necrotizing fasciitis should be known. The 3 most important ones are as follows:

- Type I, or polymicrobial
- Type II, or group A streptococcal
- Type III gas gangrene, or clostridial myonecrosis

Risk factors for necrotizing fasciitis

- Diabetes
- Chronic disease
- Immunosuppressive drugs (eg, prednisolone)
- Malnutrition
- Underlying malignancy
- Obesity
- Peripheral vascular disease
- Renal failure



Etiological Aspect of Diabetes Mellitus in NF

In immunocompromised patients with medical conditions such as malignancy, chronic heart and renal disease, intravenous drug use, immunosuppressive treatment, and malnutrition, necrotizing fasciitis primarily occurs.⁷

Diabetes is a condition that affects the immune system adversely and is thus a common underlying disease in patients with NF. In 60–70 percent of NF cases, diabetes is reported as a comorbid disorder. A research conducted at the National University Hospital of Taiwan between January 1997 and February 2013 by Chen Cheng et al. They collected 165 NF cases retrospectively.¹³

The clinical features were reported and compared according to the existence of underlying diabetes mellitus, and risk factors associated with mortality were identified. There were 84 patients with diabetes (51 per cent). They concluded that diabetic patients are more vulnerable to NF caused by polymicrobial infection or *K. pneumoniae*, and they are more likely to undergo limb amputation for infection control. Bacteraemia on admission is a significant risk factor for mortality in diabetic NF patients.

Tan et al, from the National University Hospital, Singapore, performed another report. In order to compare necrotizing fasciitis in diabetics and non-diabetics, 127 patients were checked.¹⁴ Of those, 78 (61.4%) were diabetic and 49 (38.6%) were non-diabetic. They concluded that in the diagnosis of necrotizing fasciitis in diabetic patients, the LRINEC score must be used with caution. A high suspicion index is essential to these patient's early diagnosis and subsequent management.

Table I. Laboratory Risk Indicator for Necrotising Fasciitis (LRINEC) scoring system

Variable, Units	Score
C-Reactive protein, mg/L	
< 150	0
≥ 150	4
Total white cell count, mm ³	
< 15	0
15-25	1
> 25	2
Haemoglobin, g/dL	
> 13.5	0
11-13.5	1
< 11	2
Sodium, mmol/L	
≥ 135	0
< 135	2
Glucose, mmol/L	
≤ 10	0
> 10	1

Maximum score 13. A score of ≥ 6 is suggestive of necrotising fasciitis. A score of ≥ 8 is strongly predictive of this disease.

In northern Thailand, Khamnuan et al., conducted a study on the subject "Necrotizing fasciitis: epidemiology and clinical predictors for amputation". Between 2009 and 2012, epidemiological data were obtained for all patients with a surgically confirmed diagnosis of necrotizing fasciitis.¹⁵ The most causative pathogens, they concluded, were *S. pyogenes* and *E. coli*. In patients with necrotizing fasciitis, clinical predictors of amputation included diabetes mellitus, soft tissue swelling, skin necrosis, gangrene, and serum creatinine values of ≥ 1.6 mg/dL on admission. Thus, patients with any of these predictors should be monitored closely for progression and receive early aggressive treatment to avoid limb loss.

Shaikh et al¹⁶ conducted a retrospective study to examine necrotizing fasciitis; its presentation; predisposing variables, particularly diabetes mellitus; type of infection. The research also emphasizes this condition's medical, surgical treatment and prognosis. During the evaluation period, ninety-four patients with necrotizing fasciitis were treated in their surgical intensive care unit. Diabetes mellitus had as many as 56.4 per cent of the cases. And they also found that Type 1 necrotizing fasciitis was more common in diabetic patients, whereas type 2 necrotizing fasciitis was more common in non-diabetic patients.

CONCLUSION

Necrotising fasciitis is rapidly progressive life threatening condition. Diabetes mellitus is the predisposing factor of this condition because this adversely affects the immune system.

Diabetic patients are more susceptible to NF caused by polymicrobial infection.

Patients with diabetes have reduced cutaneous function. Healing of wounds and increased infection resistance, which may affect the path of infections of soft tissue. LRINEC score must be used with caution in diagnosing necrotising fasciitis in diabetic patients.

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Abbreviations:

NF: Necrotising fasciitis

LRINEC: Laboratory Risk Indicator for Necrotising Fasciitis

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