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Necrotizing fasciitis: The need for urgent surgical intervention and the impact of intravenous drug use

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ABSTRACT

Background: Necrotizing fasciitis (NF) is a relatively rare infection of soft tissues. This study reviewed the epidemiology and pathophysiology of admissions to a tertiary referral hospital over a twelve year period comparing outcomes and findings with international norms and to identify potential areas of change to optimise outcomes.

Study design: A retrospective review of patients diagnosed with NF from Jan 1st 1999 to Dec 31st 2011 was performed. Patient demographics, risk factors, operative procedures, microbiology results and outcomes were recorded. Comparative analysis was performed.

Results: 37 patients were admitted with NF, comprising 30 males and 7 females with a median age of 55 years. The most common site of infection was the perineum (51%). The overall mortality rate was 29% and was significantly associated with age greater than 60 years ($p = 0.0018$) and the presence of one or more risk factor ($p = 0.0046$). The number of surgical procedures ranged from one to fifteen with a median length of stay of 35.5 days. There was a significant increase in the number of admissions in 2009–2010 ($p < 0.001$), coinciding with the emergence of NF in intravenous drug users (IVDU). 43% of patients ($n = 16/37$) required skin grafting, which was significantly higher in the IVDU group ($n = 5/6$, $p = 0.0232$).

Conclusions: Necrotizing fasciitis remains a significant life-threatening event. The diversity of causative pathogens emphasises the need for prompt microbiology/infectious diseases consultation. The increased occurrence within the IVDU cohort in this study highlights the need for a heightened level of clinical suspicion in these patients to prompt early surgical intervention.

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Introduction

Necrotizing fasciitis (NF) is a group of life-threatening soft tissue infections characterized by widespread necrosis of subcutaneous fascia and tissues, with relative sparing of skin and muscle.^{1,2} The causative bacteria are usually toxin producing and are extremely virulent.³ The principle anatomical sites affected are the extremities, trunk and perineum.⁴

Infection is relatively rare, with approximately 1000 new cases per year reported in the USA.⁵ Published mortality rates from the 1920's to recent times vary from 6 to 76%.⁴ In the last 20 years, mortality rates have declined but continue to vary widely from about 9 to 29%.^{4–10} Previous published literature has shown that patients with NF tend to have a number of underlying medical co-morbidities or risk factors such as diabetes mellitus, underlying malignancy, smoking, intravenous drug use, renal impairment and obesity.^{10–12} NF represents a surgical emergency as survival and outcomes depend upon prompt surgical debridement and/or fasciotomy of the infected tissue as well as appropriate anti-microbial and supportive therapy such as treatment for organ failure.^{1,4,13} An NF classification system has been used to identify patient groups based on the microbiology culture findings.^{6,10,13,14} Type 1 infections involve synergistic polymicrobial species (except β -haemolytic streptococci Group A), Type 2 are caused by β -haemolytic streptococci Group A either alone or with staphylococci and Type 3 infections are caused by *Vibrio* and *Aeromonas* species. The different types of infection occur in different patient groups. Typically Type 1 infections occur in immunocompromised individuals, Type 2 infections tend to affect the limbs in patients with no risk factors and Type 3 infections are seen in individuals exposed to salt water.^{2,6,10,13,15}

This study reviewed the clinical features, microbial aetiology and epidemiology of NF admissions to a single tertiary referral hospital over a twelve year period. The aims were to compare outcomes and findings with the published literature with a view to improving the management and outcomes of future patients.

Methods

A retrospective chart review of all patients diagnosed with NF from Jan 1st 1999 to Dec 31st 2011 was performed in Beaumont Hospital, a tertiary referral acute hospital with a catchment area of 300,000 as well as national centres for renal and pancreas transplantation, neurosurgery and cochlear implantation. The hospital is also close to Dublin airport, the largest in Ireland, and is a regional trauma centre. The Hospital In-patient Enquiry (HIPE) data system was utilized to identify all relevant admissions. This system records patients according to diagnostic related groups (DRG). Every patient admitted as a result of necrotizing fasciitis (HIPE code – M726) or Fournier's gangrene (HIPE code – N498) was identified and included. The diagnosis was verified based on documentation from the histopathologic report which confirmed the presence of NF by features such as the presence of necrosis of superficial fascia (with or without polymorphonuclear infiltrates or

bacteria) and oedema of the reticular dermis, subcutaneous fat and superficial fascia. The microbiology department is closely involved in the diagnosis and management of sterile site infections, e.g. bloodstream infections, and other complicated infections such as NF. Microscopy and culture on tissue, when available, was carried out with access to clinical advice on antibiotic therapy on a 24-h basis. Routine methods were used for isolate identification and antibiotic susceptibility testing. The data collected included demographics, mode of presentation, associated risk factors, surgical procedures, causative pathogens, anti-microbial therapies and outcomes.

Comparative analysis of the epidemiology of patients, nature of admissions and survival trends was carried out. Statistical analyses were carried out using StatsDirect software. *p* Values <0.05 were considered significant. Fisher's exact test and Chi squared tables were used for comparison of categorical data.

Results

In total 38 patients (male:female 30:8, $p < 0.0001$) were admitted with NF during the study period, seven of whom were transfers from regional or peripheral hospitals. One patient, admitted with end-stage metastatic colorectal cancer who subsequently developed NF was excluded from the analysis as she was treated palliatively. The remaining 37 patients underwent surgical debridement and are included within the analysis. Patient demographics are summarized in Table 1. The overall mortality rate was just over 29% (11/37); 23% for males and 57% for females ($p = 0.0575$). The mortality rate for patients over the age of 60 years was almost 62% compared to 12.5% in patients less than 60 years ($p = 0.0018$). One or more risk factors for NF were present in 68% of patients; smoking $n = 8/37$, neurological disorder $n = 8/37$, diabetes mellitus (DM) $n = 8/37$, obesity $n = 7/37$, intravenous

Table 1 – Patient demographics.

	Male	Female	Combined
Gender	30	7	37
Median age (range)	47 yrs (21–81)	66 yrs (46–88)	55 yrs (21–88)
Mortality	7	4	11 (29%)
Age \geq 60	8/30 (27%)	5/7 (71%)	13/37 (35%)
Median length of stay	34 days (2–140)	23 days (14–78)	35.5 days (2–140)
Risk factors			
Neurological disorder	6	2	8
Smoker	7	1	8
Underlying malignancy	3	1	4
Intravenous drug user	6	0	6
Diabetes mellitus	8	1	7
Obesity	3	4	7
End-stage renal disease	2	1	3
Site			
Perineum	17	2	19
Abdomen	2	3	5
Lower limb	7	1	8
Upper limb	4	1	5

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