

# Necrotizing Fasciitis in Indonesian Adult with Diabetes Mellitus: Two Case and Review Article

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## Case report

## Necrotizing fasciitis in Indonesian adult with diabetes mellitus: Two case and review article

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## ABSTRACT

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**Background:** Necrotizing fasciitis (NF) is a rare and life-threatening form of infection involving rapidly spreading inflammation and extensive necrosis of the skin, subcutaneous tissue, and superficial fascia.

**Case presentation:** This study reported two cases of NF in a 56-year-old female and a 38-year-old male who demonstrated typical signs and symptoms of NF. Both presented to the hospital with skin necrosis in the lower extremity, sepsis shock, and multiorgan failure. Based on the clinical presentation, physical examination, and additional examination, a diagnosis of NF was made. The LRINEC score was used to distinguish NF from other soft tissue infections. Both patients were treated with empirical antibiotics, surgical debridement and planned to be amputated, but the patients were hemodynamically unstable and passed away before the amputation proceeded.

**Discussion:** Delay in the diagnosis of NF increases the risk of mortality and the use of the LRINEC score is very helpful in decision making for health workers.

**Conclusion:** The key to the management of NF is early diagnosis, debridement, removal of necrotic tissue, amputation, and use of empirical antibiotics.

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## 1. Introduction

Necrotizing fasciitis (NF) is a life-threatening form of infection involving rapidly spreading inflammation and extensive necrosis of the skin, subcutaneous tissue, and superficial fascia with or without overlying cellulitis [1]. NF is a rare soft tissue infection and the incidence of NF in the world range from 0.30 to 15 cases per 100,000 people [2]. Delayed diagnosis and treatment for NF may contribute to extremely high mortality [3]. The author reported two cases of NF patients that illustrated the difficulty of its treatment and do a brief review of the literature on this topic. This case report used the surgical case report (SCARE) 2020 Guideline [4].

## 2. Case presentation

## 2.1. Case 1

A 56-year-old female, with type 2 diabetes mellitus (T2DM) complained of three days of fever, nausea, and gradual unconsciousness.

Five days before, she experienced pain in her right leg, which started as a tingling sensation, followed by redness and swelling. A round mass with liquid inside formed in the area of inflammation and increase in size to three days. She had no history of similar previous illnesses and no family history of such a condition. Her diabetes mellitus was treated with oral anti-diabetic drugs (metformin and glibenclamide) and she had stopped taking it 1 year previously without consulting a doctor.

Physical examination revealed weak appearance, Glasgow Coma Scale (GCS) of 7, blood pressure of 80/50 mmHg, rapid and weak pulse rate (110×/min), respiratory rate of 28×/min, and temperature of 38 °C. We found abscesses on the posterior of the right leg that was warm to palpitations (Fig. 1). Laboratory result showed hemoglobin (10.7 g/dL), erythrocyte ( $4.59 \times 10^6/\mu\text{L}$ ), MCV (69.3 fL), MCH (25.5 pg), MCHC (36.8 g/dL), white blood cell count ( $18,150/\text{mm}^3$ ), neutrophil (90.5%), lymphocyte (4.4%), platelets ( $44,000/\text{mm}^3$ ), AST (181 U/L), ALT (127 U/L), albumin serum (2.7 g/dL), blood glucose level (205 mg/dL), BUN (122 mg/dL) creatinine (8.1 mg/dL). Serum electrolyte showed mild hyperkalemia 5.3 mmol/L, sodium and chloride serum was normal, 132 mmol/L and 95 mmol/L. HbsAg and HIV rapid were non-

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**Fig. 1.** Abscess foot which the overlying skin has seen marked necrosis, margins of infection were sharply demarcated spreading from the posterior right leg to the lateral, medial and posterior aspect of the foot including all toes, the skin was edematous, and tender when palpated.

reactive. The blood gas analysis showed metabolic acidosis (pH 7.31, pCO<sub>2</sub> of 15 mmHg, pO<sub>2</sub> of 106 mmHg, HCO<sub>3</sub> of 8.7 mmol/L, Base of -18.7 mmol/L, and SO<sub>2</sub> 98%). X-ray was normal (chest, leg, and foot). The patient was diagnosed with NF of the right cruris with support Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) score of 8 [5].

The patient has debrided in the operating room which tissue and blood samples were cultured. The patient was treated with boluses intravenous fluid administration of 1500 ml of saline in 1 h and continued the fluid treatment with 1500 ml saline for 24 h, paracetamol 500 mg every 8 h, administration of empirical antibiotics before ceftriaxone 1 g IV every 12 h, and metronidazole 500 mg IV every 8 h. To correct the hyperkalemia, calcium gluconate and D40 in combination with 4 unit insulin was given, to improve the hemodynamic status, a vasopressor agent was given, norepinephrine started at 50 Nanos intravenously.

In the middle of the treatment, the hemodynamic status of the patient was worsened. The blood pressure fell gradually despite the administration of a high-dose vasopressor, the pulse was weakened and then could not be palpated, the patient was apnea and the resuscitation was started. However, the patient did not respond to resuscitation. The microbiology result was positive for group *Streptococcus pyogenes*.

## 2.2. Case II

A 38-year-old male prisoner was found unconscious inside his cell on the first day. Anamnesis to his prison guard revealed that his left leg was injured by a piece of metal a week previously and a blister appeared a few days later. The blister was enlarged and the patient complained of fever and nausea. Second days, he had been seen agitated and refused to consume any food or drink, then about 18 h later, he had been found unconscious. There was no record of medicine given to the patient. He had no history of the previous disease. However, there was a history of methamphetamine use and alcohol abuse 3 months previously, and those cases that were made him held inside the prison.

Physical examination revealed weak appearance, GCS (4), blood pressure (90/50 mmHg), rapid and weak pulse rate (102×/min), respiratory rate (28×/min), and temperature (39.5 °C). We found left leg edema and skin necrosis from his left knee to his posterior aspect of the left foot (Fig. 2). Laboratory result showed hemoglobin (11.5 g/dL), erythrocyte (3.97 × 10<sup>6</sup>/μL), white blood cell count (41,000/mm<sup>3</sup>), neutrophil (89.7%), platelets (372,000/mm<sup>3</sup>), AST (204 U/L), ALT (75



**Fig. 2.** Leg edema and skin necrosis.

U/L), albumin serum (2.0 g/dL), blood glucose (213 mg/dL), BUN (78 mg/dL), creatinine (6.35 mg/dL), hyponatremia (118 mmol/L), hypokalemia (3.0 mmol/L), hypochloremia (87 mmol/L), and CRP (89 mg/L). The blood gas analysis showed hypoxia (pH of 7.45, pCO<sub>2</sub> of 17 mmHg, pO<sub>2</sub> of 57 mmHg, HCO<sub>3</sub> of 11.8 mmol/L, Base of -12.2 mmol/L, and SO<sub>2</sub> of 91%). Chest and leg X-rays were normal. The patient was diagnosed with NF of the left leg with an LRINEC score of 8 [5].

The patient then stabilized with oxygen support and fluid administration. The patient has debrided in the operating room which tissue and blood samples were cultured. He received a total of 2000 ml of saline and was maintained to 1500 ml saline for the next 24 h. Vasopressor was given in the number of 250 Nanos. The empirical antibiotics were given ceftriaxone 1 g IV every 12 h and metronidazole 500 mg IV every 8 h. Antipyretic paracetamol 500 mg IV every 8 h. Correction of hypoalbuminemia was given with 20% albumin in 4 h. The patient was planned for an above-knee amputation.

In the middle of therapy, the patient's hemodynamic parameters deteriorated. The blood pressure fell gradually and the pulse could not be palpated, the patient was in apnea and the resuscitation was performed. However, the patient did not respond to resuscitation. The microbiology result came after and it was positive for *Streptococcus pyogenes*.

## 3. Discussion

Diabetes mellitus (DM) has been reported to be a common underlying disease in NF patients, accounting for 44.5–72.3% in various series [6]. Diabetes is a common predisposing medical condition of NF, and it is associated with a significantly higher chance of limb loss. Moreover, diabetic NF patients were more susceptible to polymicrobial and monomicrobial infection. Diabetic patients exhibit impaired cutaneous wound healing and increased susceptibility to infection, which may affect the course of soft-tissue infections [7]. Significant findings include fascial and subcutaneous tissue thickening, abnormal fluid accumulation in the deep fascia layer, and advanced cases, subcutaneous air. The mnemonic STAFF reminds us what to evaluate for Subcutaneous Thickening, Air, and Fascial Fluid [8].

Early diagnosis of NF is mandatory. However, it is not always possible as the signs are indistinguishable to those found in non-necrotizing cellulitis and abscesses, NF is frequently misdiagnosed. Any delay could prove fatal, given its association with more extensive surgery, higher rates of amputation, and higher mortality rates [3]. One of the laboratory-based scoring systems is the LRINEC score used to distinguish NF from other soft tissue infections such as cellulitis or abscess [9]. LRINEC score ≥6 predicts prognoses in terms of higher mortality, rate of amputation, complications, and mechanical ventilation requirement [10,11].

The gold standard in diagnosing NF is exploratory surgery where it is

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common to find "dishwater" or foul-smelling discharge, necrosis or lack of bleeding, and loss of the normal resistance of the fascia to finger dissection. Intra-operative biopsy with Gram stain can be used in some cases but not necessary as findings from the exploratory surgery are often definitive [12]. Early antibiotic therapy must be established against a wide range of microorganisms. If cultures demonstrate sensitive *Streptococcus pyogenes*, there is a general agreement that a combination of penicillin G and clindamycin (high doses) is the preferred option [13]. Current recommendations from the IDSA for empiric antibiotic treatment include broad-spectrum antibiotics such as vancomycin or linezolid (given its effect on exotoxin production) plus piperacillin-tazobactam or a carbapenem as well as clindamycin, given its suppresses streptococcal toxin and cytokine production [14].

Emergency surgical debridement of the affected tissues is the primary management modality for NF. Surgical debridement, necrosectomy, and fasciotomy are the main aspects of surgical treatment. Surgical intervention is life-saving and must be performed as early as possible since a delay in treatment beyond 12 h in fulminant forms of NF can prove fatal. Surgical debridement should be repeated during the next 24 h or later, depending on the clinical course of the necrotizing infection and vital functions [15]. It is imperative to perform an aggressive exploration and excision of all the necrotic and devitalized areas, with margins of 5–10 mm. Although some studies did not find a significant correlation between early surgical debridement and clinical outcomes, it is globally accepted that any delay in diagnosis and surgery is associated with a clear increase in mortality [16]. Thus, the good control of diabetic patients for the prevention of NF is very important [17].

#### 4. Conclusion

NF is a rare disease that is often found in patients with diabetes mellitus. Early diagnosis of NF can minimize the occurrence of mortality where the diagnosis of NF is supported by the LRINEC score. Management of NF includes empirical antibiotics, debridement, and amputation.

#### Consent

1  
Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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Hermina Novida is the person in charge of the publication of our manuscript.

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#### Credit authorship contribution statement

All authors contributed toward data analysis, drafting, and revising the paper, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

#### Declaration of competing interest

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Atina Irani Wira Putri and Hermina Novida declare that they have no conflict of interest.

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