World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(CASE REPORT)

Necrotizing fasciitis of the left upper limb in a male patient: Case report

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World Journal of Advanced Research and Reviews, 2025, 28(03), 1194-1198

Publication history: Received on 02 November 2025; revised on 16 December 2025; accepted on 19 December 2025

Article DOI: https://doi.org/10.30574/wjarr.2025.28.3.4123

Abstract

Necrotizing fasciitis (NF) is a rapidly progressive, life-threatening soft-tissue infection that primarily involves the superficial fascia and subcutaneous tissue. Early diagnosis, prompt surgical debridement combined with broad-spectrum antimicrobial therapy and intensive supportive care are essential to reduce mortality and the need for major amputations. Although upper-limb NF is less frequent than lower-limb involvement, when it affects the upper extremity it has been associated with higher mortality and greater perioperative morbidity. Most cases arise after trauma or postoperative infection, but NF may rarely develop in the setting of pressure injuries. The disease usually follows an aggressive course and can be fatal, particularly in outpatients with immunosuppression or chronic comorbidities.

We report the case of a 58-year-old male from a rural area with a history of type 2 diabetes mellitus and recent trauma to the left upper limb after a motorcycle accident. The patient initially resorted to traditional therapies, including treatment by a bonesetter and application of topical oils, delaying hospital care.

Keywords: Necrotizing fasciitis; Injury; Trauma; Mortality; Antibiotic therapy; Amputation

1. Introduction

Necrotizing fasciitis is one of the most severe soft-tissue infections and carries a high risk of major amputation, with reported mortality rates ranging from 6 % to 33 %, figures that have remained largely unchanged over the last twenty years.(1) Early surgical debridement of all necrotic tissue is a key determinant of outcome. However, in its initial stages the clinical picture may mimic common skin infections such as cellulitis or erysipelas, leading to delays in surgical management.(2)

The incidence of NF has been estimated at 0.3–15 cases per 100 000 inhabitants per year. Even with aggressive treatment, case fatality remains substantial and can reach approximately 34 %. Most patients present underlying conditions that predispose them to infection, including rheumatologic disease and immunosuppressive disorders such as myelodysplastic syndrome, cirrhosis and diabetes mellitus.(3)

Typical local signs include erythema, marked edema, changes in skin coloration, wound drainage, bullae or blisters, areas of necrosis and, occasionally, subcutaneous crepitus. These findings are often accompanied by disproportionate pain or pain that exceeds what would be expected from a simple skin infection, followed later by hypoesthesia or anesthesia in the affected area. Systemic manifestations include fever, toxic appearance, classic signs of septic shock and, in advanced stages, multiorgan failure.(4)

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Four main types of necrotizing fasciitis have been described in the literature:(5)

- Type I is the most frequent form (55–90 %) and is characterized by polymicrobial infection. It typically affects patients with impaired immunity and relevant comorbidities, such as diabetes mellitus.
- Type II refers to monomicrobial infections caused by group A streptococci (Streptococcus pyogenes), frequently in association with Staphylococcus aureus. This subtype is classically linked to cutaneous breaches such as wounds, trauma or injections related to drug use or medical procedures, rather than to specific comorbidities. Disease progression may be fulminant, with severe systemic toxicity, septic shock and multiorgan dysfunction.
  - Type III encompasses monomicrobial infections due to Clostridium spp., Gram-negative bacilli or Vibrio spp. It is characterized by an explosive course within 24 hours, early multiorgan failure and high mortality rates of up to 35–44 % despite optimal management.
- Type IV is caused by fungal infection, most commonly Candida spp. and zygomycetes.

Early diagnosis is crucial to reduce the morbidity and mortality associated with delayed management. Certain features help distinguish NF from uncomplicated soft-tissue infections: pain extending beyond the clinically apparent lesion due to toxin spread; absence of a clear demarcation of the affected area; the usual lack of lymphangitis because the infection primarily involves the deep fascia rather than the skin; and rapid clinical progression despite appropriate antimicrobial therapy.(6)

Imaging techniques can assist in the diagnosis of necrotizing infections, but they should not delay surgical exploration when clinical suspicion of NF is high, owing to the possibility of false-negative results.(7) Computed tomography (CT) is often the imaging modality of choice because it is widely available and fast; typical findings include deep fascial thickening, soft-tissue edema and gas in superficial planes.(8) Magnetic resonance imaging (MRI) has greater sensitivity for assessing soft-tissue involvement, but its use is limited by higher cost, longer acquisition times and reduced availability in emergency settings.

Point-of-care ultrasonography has emerged as a valuable tool for early diagnosis. It can demonstrate thickening of the subcutaneous tissue, gas and fluid collections along fascial planes. Other characteristic ultrasound findings are the cobblestoning appearance of subcutaneous tissue and hyperechoic foci with dirty posterior shadowing, described as snowflakes or dirty shadow, produced by gas within the soft tissues.(9)

Biopsy and microbiological studies remain essential. Gram staining of material obtained during surgical debridement is crucial for identifying the causative microorganisms and guiding empirical antimicrobial therapy. Histopathology in infections due to group A beta-hemolytic streptococci typically shows muscle fiber destruction, minimal inflammatory cell infiltrate and abundant Gram-positive cocci in the affected fascial planes.(10)

2. Case report

In this case we present a 58-year-old male living in a rural area who suffered a motorcycle accident with trauma to the left forearm, wrist and hand. Despite the progressive pain and his known history of poorly controlled type 2 diabetes mellitus, the patient initially sought care from a traditional bonesetter and used topical oils, without clinical improvement. Ten days after the accident, because of worsening symptoms, he finally presented to the nearest healthcare facility.

Past medical history included type 2 diabetes mellitus with poor treatment adherence. He denied drug allergies and had no history of previous surgeries.

On admission, vital signs were as follows: heart rate 110 beats per minute, respiratory rate 19 breaths per minute, oxygen saturation 94 % on room air (FiO2 21 %), axillary temperature 38.2 °C, weight 88.6 kg, height 165 cm and body mass index 32.6 kg/m^2 (grade I obesity).

The patient appeared febrile, in significant pain and restless, but he was alert and oriented to person, place and time, with preserved judgement and comprehension. His Glasgow Coma Scale score was 15/15.

Head examination showed a normocephalic skull without deformities or depressions and diffuse hair thinning. Ocular examination revealed isochoric, reactive pupils, anicteric sclerae and pink conjunctivae. Nasal fossae were patent. The

oral mucosa was slightly dry; lips were symmetrical and hydrated, with normal gums and tongue. The oropharynx was hyperemic, while tonsils and uvula were unremarkable. The neck was symmetrical, without palpable masses.

The chest was symmetrical with thoracic-type breathing and adequate chest expansion, without tenderness on palpation and with preserved lung elasticity. Cardiac percussion demonstrated physiological cardiac dullness at the left fourth intercostal space in the parasternal line, without evidence of cardiomegaly; pulmonary percussion was resonant in both lung fields. Cardiac auscultation revealed regular, normal S1 and S2 heart sounds without murmurs. Breath sounds were normal, with no crackles or wheezes.

The abdomen was globose and symmetrical. Bowel sounds were present on auscultation. On palpation, the abdomen was soft, depressible and nontender superficially and deeply. Examination of the lumbar region showed normal skin coloration and symmetry, preserved sensitivity and negative costo-vertebral and costo-muscular punch percussion. The genitourinary region was not assessed.

In the upper limbs, the right arm and forearm had normal muscle tone and strength. In contrast, the left upper limb showed decreased tone and strength, with a visible hematoma on the forearm and marked tenderness to superficial and deep palpation. The lower limbs exhibited preserved muscle tone and strength.

The complete blood count revealed leukocytosis of 14.4 k/µL with neutrophilia (72.6 %, 10.48 k/µL) and platelet count at the upper limit of normal (430 k/µL). Red blood cell count, hemoglobin (13.5 g/dL) and hematocrit (39.8 %) were within acceptable limits. Coagulation tests showed a prothrombin time of 16.0 seconds with an INR of 1.40 and an activated partial thromboplastin time of 33.7 seconds.

Serum biochemistry demonstrated marked hyperglycemia with a glucose level of 329 mg/dL and glycated hemoglobin A1c of 11.60 %, together with elevated urea (57.20 mg/dL) and normal creatinine (0.98 mg/dL). C-reactive protein was 12.5 mg/dL. Liver enzymes remained within the normal range (AST 26 U/L, ALT 25.20 U/L). The electrolyte panel showed hyponatremia (sodium 124.80 mEq/L), hypochloremia (chloride 88.60 mEq/L) and a potassium level at the upper limit of normal (4.91 mEq/L).

Soft-tissue ultrasound of the left forearm (Figure 1) revealed edema of the subcutaneous cellular tissue, free laminar fluid distributed along the fascial planes and two fluid collections, the largest measuring approximately 5 mL. The radiologic report described fluid tracking along the fascial planes and scattered hyperechoic foci within the soft tissues, consistent with early gas formation in a severely ill diabetic patient, highly suggestive of necrotizing fasciitis.

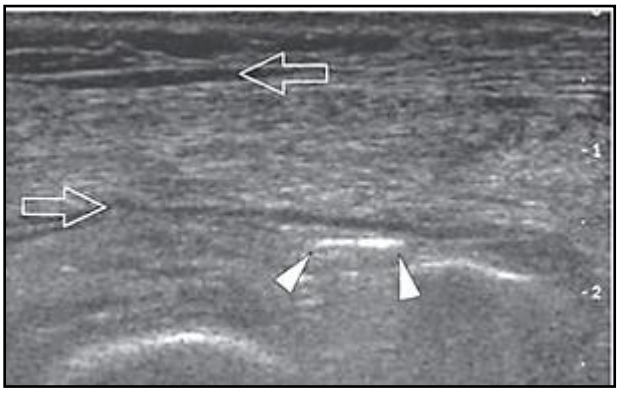

Figure 1 Soft-tissue ultrasound of the left forearm. Using a multifrequency linear transducer, the forearm was scanned, showing edema of the subcutaneous cellular tissue accompanied by the presence of free laminar fluid dispersed throughout, and two fluid collections, the largest with an approximate volume of 5 mL

A surgical biopsy with Gram staining of the affected tissue confirmed the diagnosis of necrotizing fasciitis, and Streptococcus pyogenes was identified as the etiologic agent. Based on these findings, the patient underwent urgent surgery with extensive debridement of necrotic tissue, and broad-spectrum antibiotic therapy was started immediately.

3. Discussion

Necrotizing fasciitis is considered a medical emergency because it is a severe soft-tissue infection involving the fascia and adipose tissue, leading to rapid tissue destruction. It is associated with high mortality due to systemic involvement and the swift extension of the infection from the subcutaneous tissue to the muscle. The estimated annual incidence is around 0.4 cases per 100 000 inhabitants, and affected patients are frequently immunocompromised.(11) According to the etiologic classification, this case corresponds to type II NF, as Streptococcus pyogenes was isolated as the causative organism.

The pathogenic process begins in the superficial fascia, where bacteria proliferate and produce exotoxins that facilitate spread along the fascial planes. This leads to superficial fascial necrosis and microvascular thrombosis, with secondary ischemia of the subcutaneous tissue. Subsequently, the infection extends vertically to involve both deep and superficial layers of the dermis, resulting in skin necrosis, ulcers and bullae. Typical clinical features include intense edema extending beyond the erythematous area, hemorrhagic vesicles and subcutaneous crepitus. Initially, patients often report severe and disproportionate pain, which may evolve into numbness and paresthesia as tissue necrosis progresses. Although NF remains primarily a clinical diagnosis, imaging studies are valuable for ruling out other entities, determining the extent of involvement and guiding surgical planning.(11,12)

In our patient, the initial ultrasound study demonstrated changes compatible with cellulitis, characterized by increased echogenicity of the subcutaneous tissue intersected by hypoechoic septa and the presence of gas in the soft tissues, findings that should raise suspicion of a necrotizing process.(13) Management of NF relies on early and repeated surgical debridement of all devitalized tissue, supported by broad-spectrum antimicrobial therapy targeting Gram-positive cocci, aerobic and anaerobic Gram-negative bacilli. Published series emphasize that, although NF is an uncommon disease, most affected individuals have predisposing factors. In this case, poorly controlled type 2 diabetes and the delay in seeking medical care were key contributors to the onset and progression of the infection.(14,15)

4. Conclusion

Necrotizing fasciitis is an infectious disease associated with high morbidity and mortality when not recognized in a timely manner. Risk reduction and improved outcomes depend on aggressive, urgent surgical intervention combined with appropriate systemic antibiotic therapy and comprehensive patient care. Management should not only focus on medical and surgical treatment, but also on nutritional support, psychological and family counseling and planning for functional recovery. Early clinical suspicion, prompt use of imaging techniques and close collaboration with the surgical team are essential determinants of prognosis.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed

Statement of ethical approval

Ethical approval was obtained.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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