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Necrotizing Fasciitis: A Three Case Series Highlighting Diagnostic Challenges and Treatment Approaches

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ABSTRACT

Background: Necrotizing Fasciitis (NF) is a rare but life-threatening soft tissue infection characterized by rapid fascial and subcutaneous tissue necrosis. Prompt diagnosis and aggressive surgical and medical intervention are crucial to reduce morbidity and mortality.

Case Presentation: We present a case series of three patients with distinct clinical presentations of NF, underscoring the diverse etiologies, risk factors, and management challenges. The first case involved a paraplegic male with extensive sacral and gluteal NF, illustrating the heightened vulnerability in patients with impaired mobility and chronic pressure injuries. The second patient, a previously healthy middle-aged man, developed NF following a marine-related injury, emphasizing the infectious potential of aquatic environments. The third case featured an immunocompromised female with a history of breast cancer, whose atypical presentation delayed diagnosis.

Management and Outcomes: All patients received empirical broad-spectrum antibiotics and underwent prompt, radical surgical debridement, which remains the cornerstone of NF treatment. Reconstructive efforts included the use of cadaveric heterografts and split-thickness skin grafts. While two patients achieved satisfactory wound closure, one required hip disarticulation due to failed reconstruction, highlighting the complexity of managing extensive soft tissue loss in patients with limited physiological reserve. All patients survived, despite high predicted mortality based on known risk factors, including diabetes, immunosuppression, chronic liver disease, and delayed recognition.

Conclusion: This series reinforces the importance of early recognition, broad-spectrum antimicrobial therapy, and aggressive surgical management in improving survival in NF. Although all patients survived, the cases reflect the significant morbidity, prolonged hospitalization, and reconstructive challenges associated with NF. Awareness of atypical presentations and risk factors is essential for timely intervention and optimizing outcomes.

Keywords: Necrotizing fasciitis; Soft tissue infection; Surgical infection management; Surgical debridement; Tissue reconstruction

INTRODUCTION

Necrotizing Fasciitis (NF) is a rapidly progressing, life-threatening soft tissue infection that spreads along avascular planes, such as muscle fascia, requiring urgent surgical intervention due to its high mortality and insidious onset [1,2]. The fascia's limited blood supply impairs the immune response and slows leukocyte migration, enabling rapid bacterial proliferation and leading to extensive destruction of the fascial layer, deeper subcutaneous tissue, and occasionally muscle [2,3]. Global prevalence for this condition is 0.40 cases per 100,000 people and 500 to 1,000 new cases annually [3,4]. It most commonly affects men over the age of 50 and individuals with underlying conditions such as diabetes and obesity [5]. Due to its insidious onset, rapid progression, and atypical clinical presentation, early diagnosis is often missed, contributing to a high mortality rate of up to 40% [1,6]. Without prompt treatment, NF can lead to severe tissue necrosis, septic shock, and multi-organ failure, with nearly all untreated cases proving fatal. Timely surgical intervention-ideally within 12 hours to 15 hours of hospital admission—is critical, as delays beyond 24 hours can increase mortality by up to ninefold [1-5]. Diagnosing NF in its early stages is challenging due to its nonspecific presentation, often resembling cellulitis with symptoms like swelling, erythema, and pain. However, a key clinical clue is severe pain that is disproportionate to the visible skin changes, as the infection spreads rapidly along the fascia beneath the surface. Early signs may also include local warmth, induration, skin sclerosis, foul-smelling discharge, fever, diarrhea, weakness, or nausea. The condition often begins with mild redness or swelling at a wound site, typically of traumatic origin, and quickly escalates to necrosis. NF is treated exclusively with prompt surgical removal of necrotic tissue and the administration of broad-spectrum antibiotics. Despite the importance of early recognition, accurate diagnosis at initial presentation occurs in as little as 15% of cases, underscoring the need for greater clinical awareness [1,2,4-7].

This case report presents three patients with necrotizing fasciitis, intending to enhance clinical awareness among healthcare professionals, thereby facilitating early recognition and the prompt initiation of appropriate therapeutic interventions to successfully treat patients with NF, a life-threatening condition.

CASE PRESENTATION

Patient No. I

A 46-year-old male presented to the surgical emergency department with necrotizing fasciitis in an advanced stage (Figure 1).

The patient has a history of paraplegia, sustained during the Croatian War of Independence.

Upon clinical examination, necrotizing fasciitis of the sacral, perianal, left gluteal, and posterior part of the left femoral region was identified. A fever of up to 40.5°C was observed.

Laboratory test revealed Leukocytosis (11,1/L × 109/L), elevated C- reactive protein (320 mg/L) and low albumin count (15 g/L). Wound and blood cultures were obtained to assess antibiotic susceptibility.

Following the initial diagnosis, the patient was admitted to the Department of Plastic, Reconstructive, and Aesthetic Surgery.

Figure 1: A 46-year-old male presented to the surgical emergency department with necrotizing fasciitis in an advanced stage.

Broad-spectrum empirical antibiotic therapy was started, consisting of metronidazole, gentamicin, and penicillin. Emergency surgical procedure was performed on the day of admission. Radical surgical debridement was performed (Figure 2). It consisted of radical excision of skin and subcutaneous tissues of the affected areas, including excision of the gluteus maximus and the upper part of the posterior femoral muscle compartment. Additionally, a colostomy was performed due to necrotizing fasciitis affecting the terminal rectum.

Figure 2: Radical surgical debridement was performed.

The 5th day from admission, the patient was transferred to the Intensive Care Unit (ICU) due to poor general condition. The patient underwent daily wound care and serial debridement procedures while in the intensive care unit (Figure 3). Over time, the patient showed improvement in general condition (Figure 4).

Figure 3: Image showing serial debridement procedures.

Figure 4: Improvement in general and local condition.

Following four months of treatment and failed attempts at reconstruction using free skin grafts, and in light of the patient's paraplegia, hip disarticulation was performed with the formation of a sitting stump to facilitate wheelchair use (Figure 5).

Figure 5: Formation of sitting stump.

Following completion of a comprehensive rehabilitation program, the patient exhibited full recovery on follow-up.

Patient No. II

At that time, a 51-year-old male was admitted to the Department of Plastic, Reconstructive and Aesthetic Surgery and Burns on 20.7.2016 as a transfer from the Clinic of Infectious Diseases due to necrotizing fasciitis and consequent compartment syndrome of the lower and upper part of right leg (Figure 6).

The patient's medical history reveals that he had chickenpox as a child and that he had undergone surgery on the meniscus of his right knee 3 years before hospitalization.

The patient was previously treated at the Clinic for Infectious Diseases for seven days due to erysipelas of the right lower leg caused by a sting from an unknown object while swimming in the sea. He was treated with antibiotics, but he was urgently referred for a consultative examination by a plastic surgeon who decided to transfer and hospitalize the patient at the Department of Plastic, Reconstructive and Aesthetic Surgery and Burns due to the development of compartment syndrome of the right lower leg. On the same day, he underwent fasciectomy of the antero-medial compartment and the posterior compartment (Figure 7).

After the operation, a thorough examination by an anesthesiologist was performed. During hospitalization at the Department of Plastic, Reconstructive and Aesthetic Surgery and Burns, the patient was treated with antibiotic therapy (Clindamycin and Rocephin), low-molecular heparin, analgesics and infusion preparations. Upon further diagnostic work-up, he was diagnosed with pneumonia, which was treated with the same antibiotics. During

hospitalization, the patient's general condition improved. The patient was scheduled for reconstruction of the defect in his right lower leg, but he opted to continue treatment in his home country, Sweden (Figure 8).

Unfortunately, after the patient's departure from our institution, we did not receive any feedback about his condition and recovery after the end of treatment.

Figure 6: Necrotizing fasciitis and compartment syndrome of the lower and upper part of right leg.

Figure 7: Fasciectomy of the antero-medial compartment and the posterior compartment of the right leg.

Figure 8: Local status before deciding to do reconstruction procedures.

Patient No. III

A 50-year-old woman, with a medical history of right breast carcinoma treated with surgery, chemotherapy, and radiotherapy, was admitted to the Department of Thoracic Surgery for right arm pain and suspected deep vein thrombosis. Laboratory testing on December 14 revealed marked leukocytosis and elevated C-Reactive Protein (CRP 195), prompting emergency surgical consultation. Clinical findings were consistent with necrotizing fasciitis of the right arm and right thoracic wall (Figure 9).

Figure 9: Necrotizing fasciitis of the right arm and right thoracic wall.

Emergency surgery was performed, involving extensive excision of skin, subcutaneous tissue, fascia, and portions of muscle from the right arm, thoracic wall, and back (Figure 10). The patient was admitted to the Intensive Care Unit (ICU) for postoperative management. Later the same day, surgical revision and wound toileting were carried out with no disease progression noted.

Figure 10: Extensive excision of skin, subcutaneous tissue, fascia, and portions of muscle from the right arm and thoracic wall.

On December 15, blood and urine cultures were obtained; the wound tissue culture tested positive for Streptococcus pyogenes, while urine cultures were sterile. Targeted antibiotic therapy was initiated.

On December 18, the patient underwent reconstruction using a cadaveric heterograft (1811.75 cm^2) covering the chest wall and right arm. Daily wound dressings under general anesthesia were performed. On December 24, the patient was transferred to the Department of Plastic, Reconstructive and Aesthetic Surgery for further care.

She underwent two additional surgeries: on January 2, 2018, the cadaveric graft was removed and replaced with a split-thickness skin graft from the left thigh (Thiersch technique), and on January 5, further necrotic muscle tissue (latissimus dorsi, serratus anterior, and subscapularis) was excised with new grafts harvested from the right thigh (Figure 11,12).

Figure 11: Thiersch grafts covering the defect.

Figure 12: Vital Thiersch grafts couple of days after reconstruction.

Postoperatively, the patient developed a fever (38.5°C) and required ICU readmission with mechanical ventilation and intensive support. On January 10, a right-sided pneumothorax was diagnosed and treated with a chest drain and vacuum-assisted drainage, achieving lung re-expansion. The drain was removed on the seventh day.

On January 23, surgical wound debridement with placement of retention sutures was performed. The patient's condition improved, and she was transferred back to the Plastic Surgery Department on January 30. She continued receiving antibiotic therapy guided by blood cultures, low molecular weight heparin, analgetics, gastric protection, and her chronic medications, alongside regular wound care.

She was discharged home on February 9, 2018, in improved general condition and afebrile (Figure 13).

Figure 13: Patient in good local and general status before being discharged.

DISCUSSION

Necrotizing Fasciitis (NF) is a rapidly progressing and often fatal soft tissue infection characterized by widespread necrosis of the fascia and subcutaneous tissues. Prompt diagnosis and aggressive management are critical to improving patient outcomes. This case series highlights the diverse clinical presentations, underlying risk factors, and complex management strategies associated with NF.

The three cases presented underscore the varied etiologies and presentations of NF. The first patient, a paraplegic male with extensive sacral and gluteal involvement, exemplifies the vulnerability of individuals with impaired mobility. Chronic immobility can predispose patients to pressure injuries, creating a nidus for infection. The second case involves a previously healthy middle-aged male who developed NF following a marine injury, highlighting the risk associated with aquatic environments. The third case, an immunocompromised female with a history of breast cancer, demonstrates how NF can mimic other conditions, complicating timely diagnosis [8].

Common risk factors identified across these cases include advanced age, diabetes mellitus, immunosuppression, and chronic liver disease. These factors have been consistently associated with increased mortality in NF patients [9].

NF is frequently polymicrobial, involving a mix of aerobic and anaerobic organisms. In the presented cases, empirical antibiotic therapy was initiated promptly, covering a broad spectrum of potential pathogens. This approach is supported by literature, which emphasizes the importance of early and appropriate antimicrobial therapy in improving survival rates [10].

Early and aggressive surgical debridement remains the cornerstone of NF management. All patients in this series underwent radical debridement, which is associated with improved survival outcomes. Reconstructive strategies varied based on the extent of tissue loss and patient factors. The use of cadaveric heterografts and split-thickness skin grafts facilitated wound coverage and healing. However, in the case of the paraplegic patient, reconstruction efforts were unsuccessful, necessitating hip disarticulation. This underscores the challenges in managing extensive soft tissue defects in patients with limited mobility.

The mortality rate for NF remains significant, with studies reporting figures ranging from 5% to 72%. Factors influencing prognosis include the presence of comorbidities, delay in surgical intervention, and the causative organism. In this series, all patients survived, highlighting the effectiveness of timely and comprehensive management. However, the need for prolonged hospitalization and rehabilitation underscores the substantial morbidity associated with NF [9].

CONCLUSION

This case series illustrates the heterogeneous nature of necrotizing fasciitis and the importance of a multidisciplinary approach in its management. Early recognition, aggressive surgical intervention, appropriate antimicrobial therapy, and comprehensive postoperative care are essential to improving patient outcomes. Continued research into the pathophysiology and optimal management strategies for NF is warranted to further reduce mortality and morbidity associated with this devastating condition.

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AUTHORSHIP CONTRIBUTION STATEMENT

Vedran Beara MD: Writing: original draft, Writing - review & editing, Project administration, Visualization, Methodology; Tomislav Žuvela MD: Writing: original draft, Data curation, Visualization; Vladimir Huić MD: Writing: original draft; Zvonimir Križanac MD: Writing: original draft; Frane Utrobičić MD: Resources; Veridijana Šunjić Roguljić MD, PhD: Conceptualization, Methodology; Žana Rupić Bacc. Med. Tehcn: Data curation; Ivo Utrobičić MD, PhD: Assistant professor - Supervision, Resources, Conceptualization

AUTHORSHIP CONFIRMATION

All authors have made substantial contributions to the work reported in this manuscript. Each author has read and approved the final version of the manuscript and agrees to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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