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CASE REPORTS

Necrotizing Fasciitis, as a Dramatic Complication of Infectious Diseases, Remains a Significant Challenge for Doctors

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Abstract

Introduction: Fasciitis is an inflammation of the fascia, the connective tissue that surrounds muscles, blood vessels, and nerves, which can rapidly progress to necrosis of these structures, leading to life-threatening situations. It is a polymicrobial infection caused by bacterial agents, fungi, viruses, and parasites, resulting in septicemia, multiorgan failure, septic shock, and potentially death. The LRINEC score is a valuable tool in diagnosing necrotizing fasciitis (NF).

Case Presentation: The patient is a 62-year-old woman with a history of Diabetes Mellitus type 2 and Bilinear Myelodysplasia, currently receiving high-dose corticosteroid therapy. She was recently diagnosed with Herpes Zoster affecting the S1, S2, S3, S4, and S5 dermatomes. Initially, she was treated for 8 days with antivirals and antibiotics for symptoms of fever, fatigue, and pain in the gluteal and lumbar regions. However, her condition worsened, prompting her readmission to the hospital, where she developed signs of sepsis. After imaging, laboratory tests, and consultations with surgeons, she was diagnosed with necrotizing fasciitis. Multidisciplinary management and complex therapy led to an excellent outcome.

Conclusion: Necrotizing fasciitis presents a significant diagnostic challenge due to its rarity and its clinical resemblance to other critical conditions. It is an urgent pathology that requires not only surgical intervention but also immediate medical attention. It has always intrigued healthcare professionals both locally and internationally. Early diagnosis remains the primary challenge, and the management of these patients by experienced senior surgeons is crucial for successful outcomes.

Keywords: Necrotizing fasciitis, sepsis, infectious diseases, herpes zoster, diabetes mellitus, corticosteroid therapy

Introduction

Fasciitis is an inflammation of the fascia, the connective tissue that surrounds muscles, blood vessels, and nerves, which progresses rapidly with fascial necrosis, leading to a life-threatening medical condition. There are five types of fasciitis: necrotizing fasciitis, plantar fasciitis, ischemic fasciitis, eosinophilic fasciitis, and paraneoplastic fasciitis. Hippocrates first characterized necrotizing fasciitis (NF) in the fifth century as a life-threatening soft tissue disease, while former Confederate Army surgeon Joseph Jones coined the term "necrotizing fasciitis" in 1871. [1]

In 1952, Wilson coined the term necrotizing fasciitis without specifying a particular pathogenic bacterium associated with the disease. [2]

More than 500 to 1,000 cases of necrotizing fasciitis (NF) are identified each year in the United States, according to the U.S. Centers for Disease Control and Prevention (CDC).[3]

Conditions such as surgical wounds, chronic venous ulcers of the extremities, and damaged skin from cracks, burns, bites, or manipulations (including illicit drug use) can increase the risk of developing necrotizing fasciitis (NF) in

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patients. Risk factors include obesity, alcohol use, diabetes, malnutrition, advanced age, immunosuppressant use, and diseases such as HIV or malignancies. [4, 5]

Necrotizing fasciitis is a polymicrobial infection involving bacterial, fungal, viral, and parasitic agents—such as Group A beta-hemolytic streptococci, Streptococcus (not group B), Staphylococcus aureus, Staphylococcus (not aureus), Clostridium, Pseudomonas, Klebsiella, Serratia, Neisseria, Escherichia, Morganella, Proteus, Shigella, Vibrio, Salmonella, Pasteurella, Enterobacter, Corynebacterium, Cryptococcus, Fusobacterium, Peptococcus, Eikenella, and Bacteroides—that can lead to septicemia, multiorgan failure, septic shock, and death. However, even a single species can be responsible for the development of NF. [4]

The key factor in the pathophysiology of necrotizing fasciitis (NF) is the proliferation of microorganisms and their spread from the subcutaneous tissue along superficial and deep fascial planes, along with the role of bacterial enzymes and toxins released by these microorganisms. High fever, tachycardia, hypotension, and tachypnea are critical clinical signs indicating neurogenic shock. [6]

There is a scoring system known as LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis), which functions as a risk indicator for the disease. [7]

Wong et al. utilized a series of clinical and laboratory parameters to predict and diagnose necrotizing fasciitis (NF) in patients with soft tissue infections, thereby enabling timely treatment. NF represents both a medical and surgical emergency, where surgery plays a decisive role in confirming the diagnosis, supported by imaging modalities such as ultrasound (US), CT, and MRI.

Surgical evaluation, intraoperative tissue biopsy, and tissue cultures for microorganisms represent the gold standard for diagnosis. Rapid and timely diagnosis is a critical responsibility for physicians, as the infection can progress over days or weeks, with life-threatening consequences potentially developing within hours of its onset. This underscores the urgency of early diagnosis and treatment. [8]

The management of NF is a multidisciplinary effort that requires collaboration among surgeons, intensivists, and other specialized healthcare professionals. This highlights the significance of multidisciplinary management in treating necrotizing fasciitis. While some infectious diseases resolve without complications, there always remains a risk that these conditions may be complicated by secondary bacterial skin infections, potentially leading to cases of NF. Infectious pathologies often weaken both cellular and humoral immunity, further encouraging the development of NF. [9, 10]

NF can be diagnosed late, as it may be mistaken for other skin infections such as erysipelas or cellulitis. Conditions like erysipelas, anthrax, varicella zoster, mononucleosis, listeriosis, HIV/AIDS, borreliosis, brucellosis, COVID-19, cat scratch disease, and others, if not evaluated promptly, can develop into NF.

Necrotizing fasciitis and superficial gangrene are well-documented complications of herpes zoster, along with other musculoskeletal complications such as osteomyelitis, septic arthritis, pyomyositis, and more.[9]

Materials and Methods

We present a case of immunodeficiency (diabetes mellitus under insulin therapy for 10 years, Bilateral Myelodysplasia under high-dose corticosteroid therapy) who, after a herpes zoster infection, developed a clinical picture of a septic condition with related fasciitis, but had an excellent clinical outcome. Meanwhile, we searched the literature for the Zoster-Fasciitis combination, as well as for other infectious nosologies that may complicate into fasciitis and require mandatory collaboration with the surgeon.

Case presentation.

The patient, a 62-year-old woman with Type 2 Diabetes Mellitus under insulin therapy, presented with FUO (fever of unknown origin) for more than 3 weeks. She was hospitalized and diagnosed with autoimmune hemolytic anemia**,** which was later found to be bilinear myelodysplasia. She began high-dose corticosteroid therapy, and after 7-8 weeks, she developed a clinical picture of gluteal zoster involving dermatomes S1, S2, S3, S4, S5 (Figure 1).

Figure 1. Image of gluteal zoster affecting dermatomes S1, S2, S3, S4, S5

After eight days, the patient presented with fever, high temperature, fatigue, severe pain in the gluteal and lumbar regions, and restricted mobility. Oral antibiotic therapy was prescribed for bacterial superinfection, alongside aciclovir from her general physician.

As the clinical situation worsened with a general state of poor health, the patient was readmitted with all the signs of sepsis. Laboratory results showed: neutrophils, 89.9%**;** leukocytosis, 17,500 g/dl**;** thrombocytosis, 540 k/ul**;** anemia, 2.95 uL**;** elevated inflammatory markers like CRP, 41.92 mg/dl**;** ferritin, 5410.23 ng/ml**;** fibrinogen, 754 mg/

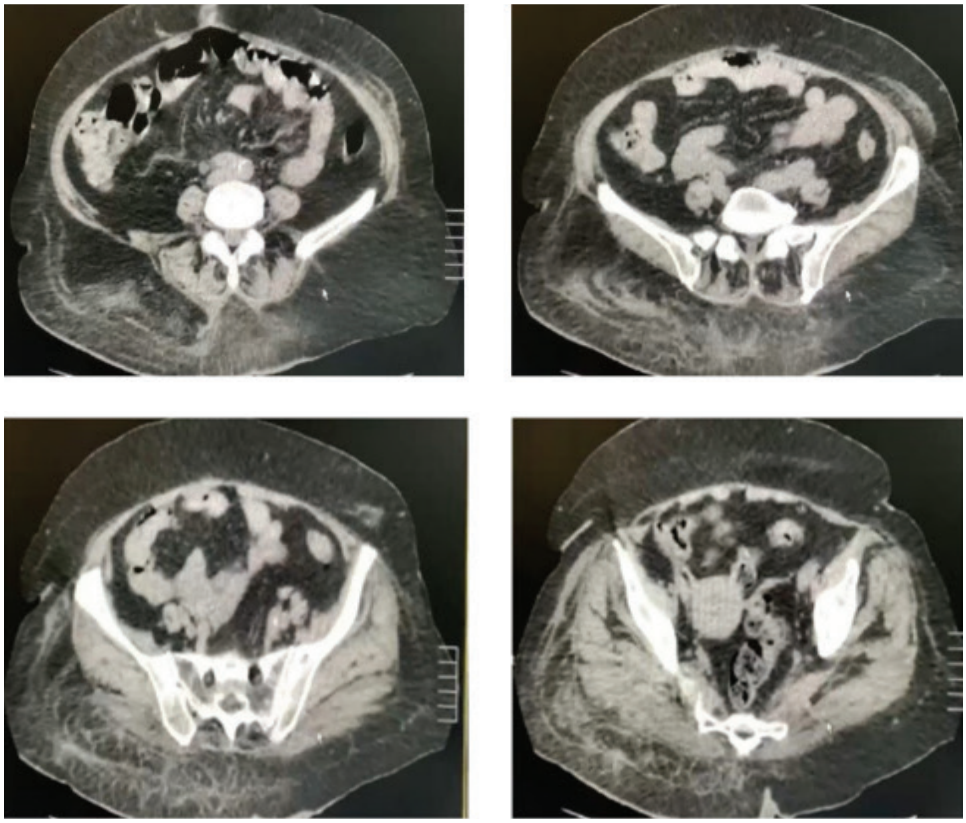

Figure 2. CT- scannerof the abdomenrevealeddense subcutaneous adipose tissue densificationin the posterior lumbar wall, extending from T12 to the femoral region

dl**;** D-Dimer, 5.74 ug/ml**.** CT of the abdomen revealed dense subcutaneous adipose tissue densification in the posterior lumbar wall, extending from T12 to the femoral region (Figure 2). Ultrasound showed pronounced edema from T12 to the gluteus, with small abscess zones.

A consultation with the surgeons confirmed infected fascitis with deep necrosis in the lumbar-femoral region. (Figure 3)

The patient, in addition to receiving intravenous antibiotics and undergoing symptomatic complex therapy,

Figure 3. Infectedfascitis with deep necrosis in the lumbar-femoral region.

also underwent surgery as part of their treatment plan. Ultimately, this comprehensive approach resulted in an excellent clinical outcome (Figure 4).

F n an

Disscussion

Necrotizing fasciitis presents a diagnostic challenge due to its rarity and similarity in presentation to other critical conditions. It is an urgent pathology, not only surgical but also encountered in clinical practice, which has always intrigued our colleagues both domestically and internationally. [9, 10, 11, 12, 13]

Infectious pathologies often present clinical scenarios that require both surgical and intensive care, as seemingly harmless infections can sometimes conceal life-threatening conditions. Patients with compromised immunity, whether due to disease or therapy, may exhibit an atypical clinical presentation of NF**.** Hypotension, tachycardia, and pain that arise outside the typical course of an infectious disease should alert an infectious disease specialist to consider NF as a potential diagnosis. [14]

Pain is certainly a significant clinical sign; however, it may occasionally be absent due to the necrosis of superficial nerves. [15]

Herpes zoster is a viral infection caused by the reactivation of the varicella-zoster virus, characterized by fluid-filled blisters on painful, erythematous skin. Patients who have had or are currently experiencing this viral infection, regardless of their immune status, may develop a secondary bacterial infection that can lead to necrotizing fasciitis (NF). From the onset of vesicular lesions to the appearance of NF, 2-3 weeks may elapse.

Superinfection occurs specifically in the areas corresponding to the affected dermatomes. The vesiculopapular rash caused by herpes zoster can act as a portal for bacterial infection. Since NF is a rare complication, it may be overlooked, making early treatment of secondary bacterial infections crucial for significantly reducing its incidence, which can develop in 1-4% of cases. [16]

LRINEC, a risk indicator for the development of necrotizing fasciitis (NF), has become a widely used tool among physicians, even in infectious diseases such as Herpes Zoster. Its results facilitate the differential diagnosis between NF and other soft tissue infections.

NF can mimic common skin infections, and these infections can also develop into NF as a complication. It is often hard to believe that conditions like erysipelas can escalate into life-threatening situations. [17]

Mononucleosis, typically a benign condition, can occasionally be accompanied by life-threatening complications, such as septic states that progress to cervical and mediastinal necrotizing fasciitis (NF). In these instances, imaging techniques (CT/MRI) are essential for evaluating the extent and severity of the condition. [18, 19]

Listeria monocytogenes, a pathogen linked to consuming unpasteurized milk, cheese, or dairy products, can be found in both blood and tissue cultures. Although rare, it has the potential to develop into necrotizing fasciitis (NF), making this a possible but uncommon complication of listeriosis. [20, 21]

Borrelia spp. has been suggested as a potential factor in the development of eosinophilic fasciitis due to its ability to colonize and alter the structure of collagen fibers. [22]

The incidence and severity of Fournier's gangrene have increased in the HIV/AIDS era, raising the need for further investigation into whether this coexistence impacts the prognosis of Fournier's gangrene. [23] Necrotizing fasciitis (NF) can occur either as part of the disease progression or as an initial manifestation of the condition. [24]

The skin can act as an entry point for Gram-negative bacteria, such as Brucella, primarily through hematogenous routes of infection. Necrotizing fasciitis (NF) has been documented in the literature as a complication of this process. [25]

If these patients undergo a thorough medical history, we would likely discover their consumption of unprocessed dairy products, contact with animals such as cattle, sheep, or goats, or occupational exposures related to these activities. The COVID-19 disease, caused by the SARS-CoV-2 virus, became a global pandemic. Its symptoms and signs vary, affecting multiple organs and systems. One of these complications is necrotizing fasciitis (NF). [26]

Meanwhile, it is essential to note that the COVID-19 vaccine can also cause fasciitis at the injection site or even at distant locations. [27]

Antibiotic therapy, emergency surgery, hyperbaric oxygen therapy, and the administration of intravenous polyspecific immunoglobulins significantly reduce morbidity and mortality. The mortality rate ranges from 6% to 33% and has remained unchanged over the past 20 years. [28]

Delays in both diagnosis and surgical intervention contribute to 80% of deaths in patients with necrotizing fasciitis (NF). [29]

Conclusion

This article underscores the need for obtaining a detailed medical history, maintaining a high level of suspicion, and ensuring a prompt diagnosis of complications, such as necrotizing fasciitis (NF), in patients who are clinically deteriorating.

Identifying patients at high risk of mortality is critical. Understanding the disease, administering appropriate antibiotic therapy, maintaining effective collaboration with the surgeon for timely surgical debridement, and adopting a multidisciplinary approach are essential for preventing sepsis and multiple organ failure.

Antimicrobial treatment is essential but remains secondary to the removal of damaged and necrotic tissue. Furthermore, hyperbaric oxygen and intravenous polyspecific immunoglobulins act as effective adjunctive therapies. Early diagnosis remains the primary challenge, and management by experienced surgeons is crucial for successful treatment.

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Abbreviations

LRINEC - Laboratory Risk Indicator for Necrotizing Fasciitis; NF - Necrotizing Fasciitis; CDC - Centers for Disease Control; US – Ultrasound; CT - Computed Tomography; MRI - Magnetic Resonance Imaging;

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