Case Report

Fulminant necrotizing streptococcal myositis with dramatic outcome – a rare case report

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Abstract

Necrotizing myositis represents a rare, aggressive form of bacterial-induced soft tissue necrotizing infection. We present a fulminant case of a 44-year-old patient with a necrotizing soft tissue infection and a history of rheumatoid arthritis transferred to our service, Cluj-Napoca Emergency County Hospital, from a local hospital where he had been admitted two days before with chills and light-headedness after an accidental minor blunt trauma in the right thigh region. After admission to our hospital and first assessment, broad spectrum antibiotherapy was started with Meropenem, Vancomycin and Metronidazole along with surgical debridement. The evolution was fulminant with rapid development of multiple organ dysfunction syndrome, therefore he was transferred to the intensive care unit, intubated, and started the volemic resuscitation and vasopressor therapy. The blood culture was positive for group A beta-hemolytic streptococcus (GAS) and high dose Penicillin G was added to the therapeutic scheme. Despite all efforts, the patient developed disseminated intravascular coagulation syndrome and died in the next hours. The clinical picture together with the findings from the autopsy were suggestive for a streptococcal toxic shock syndrome developed as a complication of GAS induced necrotizing myositis.

Keywords: necrotizing myositis, soft tissue infection, immune suppression, streptococcal toxic shock syndrome

Introduction

Necrotizing myositis represents a fulminant, life-threatening form of necrotizing soft tissue infection (NSTI) that involves fascia, subcutaneous tissue and muscle. It is typically associated with the presence of group A beta-hemolytic streptococcus (GAS, *Streptococcus pyogenes*), but also other 'flesh-eating bacteria' such as *Peptostreptocous spp.*, *Fusobacterium spp.*, *Bacteroides spp.*, and *Enterobacterales* [1]. Clinically it is characterized by fast, massive tissue destruction and signs of systemic toxicity. Bacteria cross the skin barrier through small entry points caused by scratches and punctures that could occur even without noticing during daily activities. Thus, the most commonly affected parts are usually the lower limbs. The initial signs are often non-specific with minimum inflammatory signs, hence a high level of clinical suspicion must be in place to diagnose early stages of disease and to boost survival chances. In general, patients have predisposing conditions like diabetes mellitus or various forms of immunodeficiencies, acquired or iatrogenic. The most common clinical presentation of these patients are septicemia, cellulitis or abscess. The standard of care is emergency surgical intervention with massive debridement of all necrotic tissues and broad spectrum antibiotherapy. Mortality rates are high, currently even with the most recent advances in medicine mortality is around 20% and is touching 100% in the absence of immediate medical intervention [2,3].

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Case report

A 44 years old Caucasian male with a previous history of rheumatoid arthritis for which he was receiving immunosuppressive treatment with Methotrexate and Tocilizumab presented to a local rheumatology ward with chills and light-headedness. Two days prior to hospital presentation the patient admitted having an accidental blunt trauma in the right thigh region while working in the yard. There were apparently no skin breaches, or subcutaneous crepitus at the trauma site. Soon the general state altered with high fever, local muscle pain and right lower limb edema accompanied by blisters formation and the development of a bluish-black coloration in the trauma cutaneous corresponding area. Therefore, the patient was urgently transferred from a local hospital to our facility at the Cluj-Napoca Emergency County Hospital. The initial assessment suggested a necrotizing soft tissue infection which lead to the urgent initiation of the mixed pharmacological and surgical treatment with broad spectrum antibiotherapy with Meropenem, Vancomycin and Metronidazole was started along with three decompressive fasciotomies. During the surgical assessment the superficial muscle fascia seemed viable, there were no fetid discharges, but the right and medial vastus femoral muscles had incipient necrotic areas for which debridement was performed. The patient became rapidly obnubilated, dyspneic, with blood gas analysis showing hypoxemia, marked metabolic acidosis with high lactate levels, which required immediate orotracheal intubation. The patient started to develop multiple organ dysfunction syndrome, he became hypotensive (BP= 60/34 mmHg) and tachycardic (160 beats/minute). He was transferred to the intensive care unit where aggressive volemic resuscitation was started along with vasopressor therapy. The patient was febrile (t=38.3°C), severely pancytopenic (L=1530/µL, RBC=1.8×10^6/µL, Tr=15000/µL), hypoproteinemic (total proteins=2.7 g/dL), presenting low serum fibrinogen, spontaneously prolonged coagulation (INR=3), marked renal dysfunction (creatinine 4.25 mg/dL, BUN=120 mg/dL) and increased markers of inflammation (CRP=13 mg/dL). Severe rhabdomyolysis was present (CK=22178 U/L, almost 130 times above normal value), along with increasing levels of transaminases (ALAT=1715 U/L, ASAT=6381 U/L), serum bilirubin (total bilirubin 4,58 mg/dL) and lactate dehydrogenase (LDH=3969 U/L). A constant oozing hemorrhage could be noted at the site of the surgical wound. Blood transfusions comprising erythrocytes and platelets concentrates, fresh frozen plasma, cryoprecipitate, as well as administration of prothrombin complex and activated factor VII were undertaken considering the presence of intravascular disseminated coagulation syndrome with profound bleeding. Intermittent hemodiafiltration was instituted. Both blood and tissue cultures grew GAS, so high dose Penicillin G was added to the therapeutic plan. Local surgical hemostasis was attempted in the first instance, but soon afterwards the patient returned to the operating theatre given the rapid extension of tissue necrosis. Extensive debridement comprising skin, subcutaneous fatty tissues, superficial fascia, thigh muscles leaving femoral periosteum exposed, scrotum and perineal tissues was undertaken. Despite vigorous medical efforts the patient's death occurred less than 48 hours after the arrival in our facility. Autopsy was performed and findings included multiple elevated vesicular lesions on the skin of arms and left thigh (Figure 1).

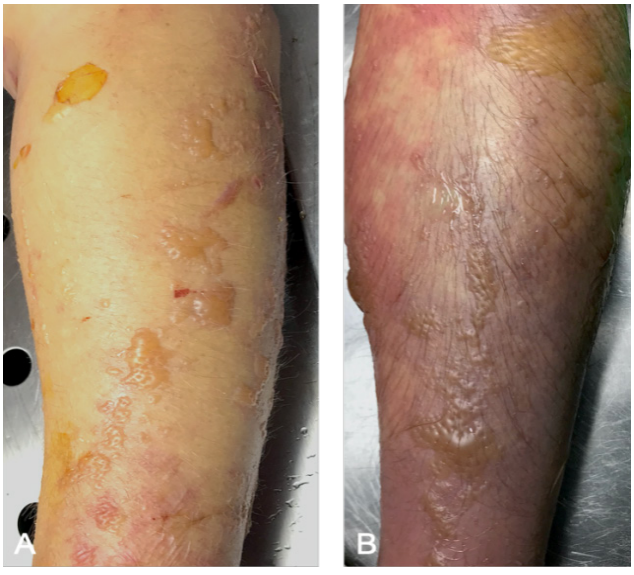

Figure 1. A - left forearm, **B -** Left leg. Superficial skin yellow vesicles filled with liquid.

The scrotum was removed and the testicles exposed due to surgical intervention. Inflammatory lymphadenopathy was noted in the femoral triangle (Figure 2).

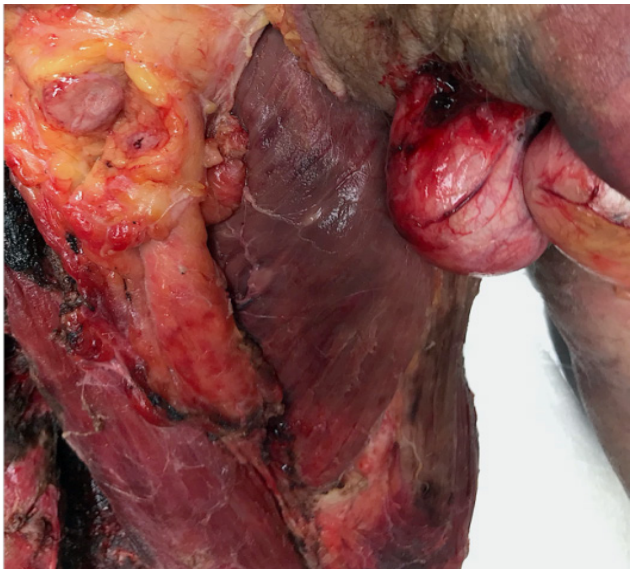

Figure 2. An inflammatory inguinal lymphadenopathy can be seen in the upper left, along with the exposed testicles after massive debridement.

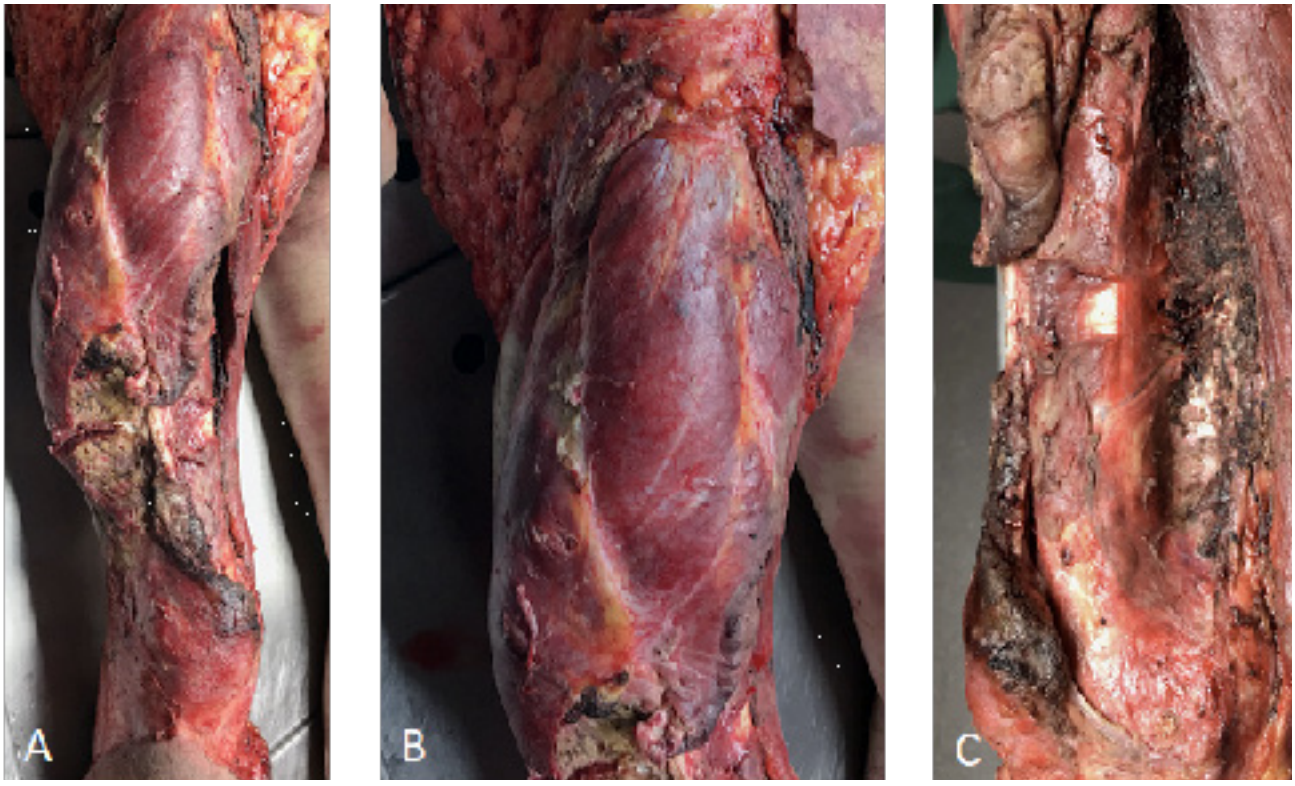

Figure 3. A - Right inferior leg after surgery debridement of the affected skin, fascia and muscles. **B -** Lateral view. **C -** Medial view.

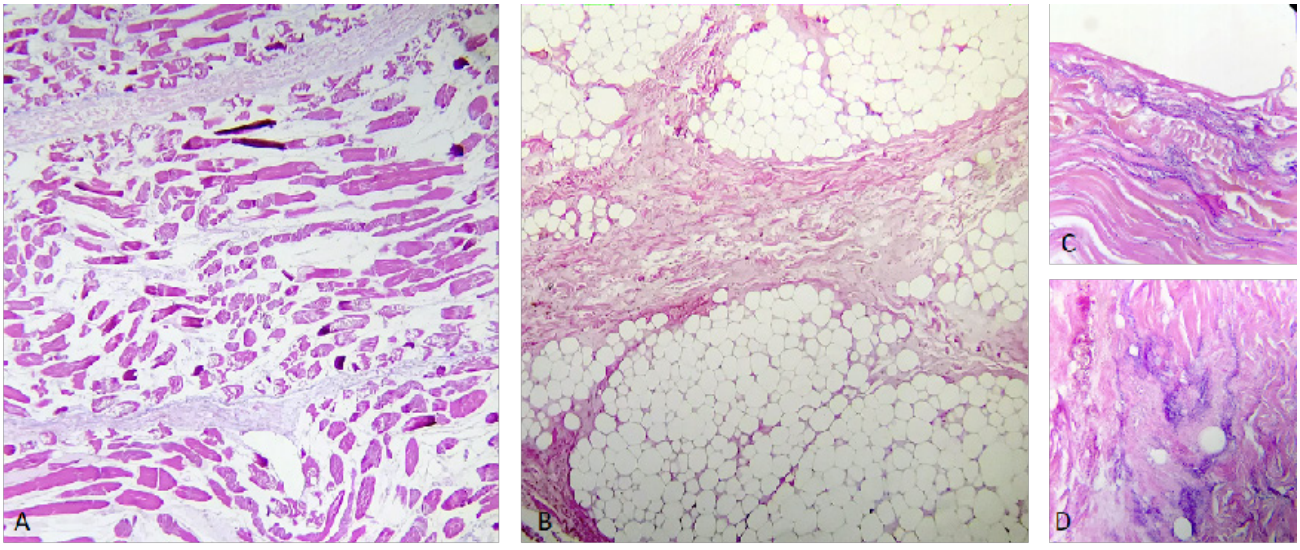

Figure 4. All the images are stained using hematoxylin-eosin. **A –** muscular and fascial necrosis. **B –** fat necrosis and fascial necrosis. **C & D –** bacterial colonies, gas vesicles and fascial necrosis.

The right hip and thigh were severely affected by the progressive disease and due to extensive debridement of the skin and subjacent tissues the muscles were exposed (Figure 3).

Histological examination of the surgical specimens yielded the presence of extensive necrosis including hypodermic fat, fascia and muscle tissue, with widespread vascular thrombosis, bacterial colonies and gas bubbles distorting normal tissue architecture (Figure 4).

Discussion

Necrotizing myositis represents a life-threatening condition, requiring a high level of suspicion in order to perform a quick diagnosis, which is the sine qua non condition to improving prognosis [4]. The main etiologic agent described in literature is GAS (*Streptoccus pyogenes*), although other pathogens like Clostridium, Staphylococcus, Vibrio, Aeromonas and Pasteurella have been identified [5,6]. Major risk factors associated with invasiveness are minor trauma, use of nonsteroidal anti-inflammatory drugs, recent surgery, obesity, poor socio-economic status, malignancy and immunosuppression [7]. In the particular case of our patient both minor local trauma and pharmacological immunosuppression could be identified as known risk factors for NSTI. Patient treatment consisted in a combination of Methotrexate and Tocilizumab which have been previously individually described as risk factors for NSTI [8,9]. In our case we speculate that this combination of two immune system suppressants, could be the favoring factor for the fulminant evolution leading to death. Pathogenesis is incompletely understood and implies complex interactions between the human host defense mechanisms and specific bacterial virulence factors. Of those we mention the cell surface M protein and streptococcal exotoxins [10,11]. The increasing prevalence of M1 and M3 subtypes seems to be responsible for the increasing number of severe streptococcal invasive infections in the last years [12,13]. Also, these strains have been more often associated with the streptococcal toxic shock syndrome (STSS). STSS represents a feared complication of GAS invasive infections, occurring in up to one third of cases [14]. It is defined by hypotension and multiple organ failure, with renal impairment, coagulopathy, liver and respiratory failure [7]. The streptococcal exotoxins are the center of its pathogenesis by inducing the release of inflammatory cytokines leading to tissue damage and increased capillary leak. Treatment resides in fluid management, respiratory ventilation, vasopressor support, renal replacement therapy, along with antibiotics, draining off the source of infection and adjunctive therapies like intravenous immunoglobulins. Despite energetic efforts, STSS is characterized by extremely high mortality rates.

Laboratory findings are nonspecific and positive diagnosis relies on quick, thorough surgical examination corelated with microbiological tissue or secretions result and the histopathological exam of the necrotic debridement specimens [15]. Imagistic approaches are also of little value to diagnosis as many findings are once again nonspecific [16]. Therapeutic pillars consist in aggressive surgical debridement until reaching healthy tissue, empiric broad spectrum antibiotherapy that is later tailored to culture results and hemodynamic resuscitation. Multiple interventions might be needed to control the spread of infection, which could lead to limb amputation as a last solution that should not be overlooked. Antibiotherapy should cover the spectrum of causative microorganisms: *Streptococcus pyogenes*, *Staphylococcus aureus*, *Methicillin-resistant Staphylococcus aureus*, Gram-negative aerobes and anaerobes [17]. Two adjuvant therapies currently used are: hyperbaric oxygen therapy (HBOT) and intravenous immunoglobulins (IVIG). HBOT aims to improve tissue oxygenation, thus preventing an anaerobiotic environment, but has failed to prove a mortality benefit [18]. IVIGs are favored in the setting of NSTIs associated with toxic shock syndrome in order to neutralize bacterial exotoxins and limit systemic inflammation. If the patient survives, plastic surgery with skin and grafts is needed in an attempt to restore functionality and esthetics.

Conclusion

We described a fulminant case of necrotizing myositis in a young, but pharmacologically immunosuppressed underlining the extreme aggression of soft tissue streptococcal infections. Integrating the clinical, paraclinical and autopsy findings we conclude that this case was a GAS induced necrotizing myositis complicated with STSS which was responsible for the systemic manifestations. This entity should be considered by surgeons, dermatologists and emergency medicine professionals especially in patients undergoing immunosuppressive treatment. Furthermore, double immunosuppression, as seen in this case, should be evaluated with care as it may pose patients to an additional risk. Clinicians must be aware of this entity and carefully screen potential patients for it to ensure best outcomes for those affected. In these diseases time is both flesh and life.

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