

Venous Gas Embolism in Necrotizing Fasciitis of the Lower Limb Presenting as Acute Limb Ischemia: A Case Report

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1. Abstract

A woman presented to the emergency room of our hospital with intense pain in the right leg, which was presumed to be acute limb ischemia. A duplex ultrasonography and Angio-Computed tomography scan confirmed a condition of ischemia, detected the presence of subcutaneous gas in the right leg and air bubbles in the femoral vein, raising the possibility of necrotising fasciitis [NF]. Despite the aggressive treatment, the patient died a few hours later. This case should serve as a reminder to consider a rapid systemic involvement in patients with a progressive infection such as NF.

2. Introduction

Necrotizing fasciitis [NF] is a rare but rapidly progressive, life-threatening bacterial infection of the skin and soft tissue [1, 2]. It shortly develops into extensive necrosis of the fascia and subcutaneous tissues causing, in extreme cases, a condition of septic shock and death of the patient [3]. In NF associated with Streptococcus type A infection damage can be caused by released exotoxins, which can lead to microvascular damage and to a faster course towards septic shock [4, 5]. We report a case of NF associated with venous gas embolism.

3. Narrative

A 78-year-old woman was referred to the emergency department of our hospital for intense pain in the right leg lasting since the previous day. She suffered from metastatic breast cancer under chemotherapy treatment, and had a history of acute coronary syndrome and squamous cell carcinoma of the tongue. On examination, the patient had fever at 38°C, asymmetrical lower limbs due to massive right leg edema associated with hematoma and hyper-

aemia with pale extremities. The right leg presented appreciable subcutaneous crepitus on palpation, was warm on touch and with functional impotence; it also had undetectable popliteal and tibial pulses. At the beginning, there were no significant disorders in the clinical examination of the chest, heart, and abdomen but, during the observation in the emergency department, sudden desaturation and mild dyspnoea appeared.

4. Diagnostics

Blood tests revealed leukopenia (WBC 1.45x10³/μl, Neutrophils 0.6x10³/μl), anemia (Hb 7.1 g/dl), thrombocytopenia (24x10³/μl), mild variations in coagulation values (aPTT 24 s, INR 1.04), increased levels of AST (36 U/l), CRP (70.1 mg/l) and procalcitonin (34.60 ng/dl). Blood gas analysis demonstrated a decline in SpO₂ (69.5 mmHg). A duplex ultrasound scan of the right lower limb could not detect flow in the popliteal artery and in the anterior and posterior tibial arteries. An Angio-CT scan of the chest-abdomen-lower limbs showed an important gas collection in the fascial planes and subcutaneous tissues (Figure 1) compressing arteries of the right leg (Figure 2); it also showed air bubbles in the femoral and external iliac veins (Figure 3 and 4). Intravascular gas during an infection called for immediate attention. The patient was given oxygen therapy at 2 l/min, and anticoagulant therapy with low molecular weight heparin and broad-spectrum i.v. antibiotic therapy (Clindamycin phosphate 600 mg/4 ml) was started. Urgent extensive debridement of the necrosed tissues of the right leg, associated with fasciotomy, was performed in order to resolve acute ischemia due to compartment syndrome. A few hours after surgery, the patient's general condition plummeted because of sepsis and aggravating dyspnoea which eventually led to death.

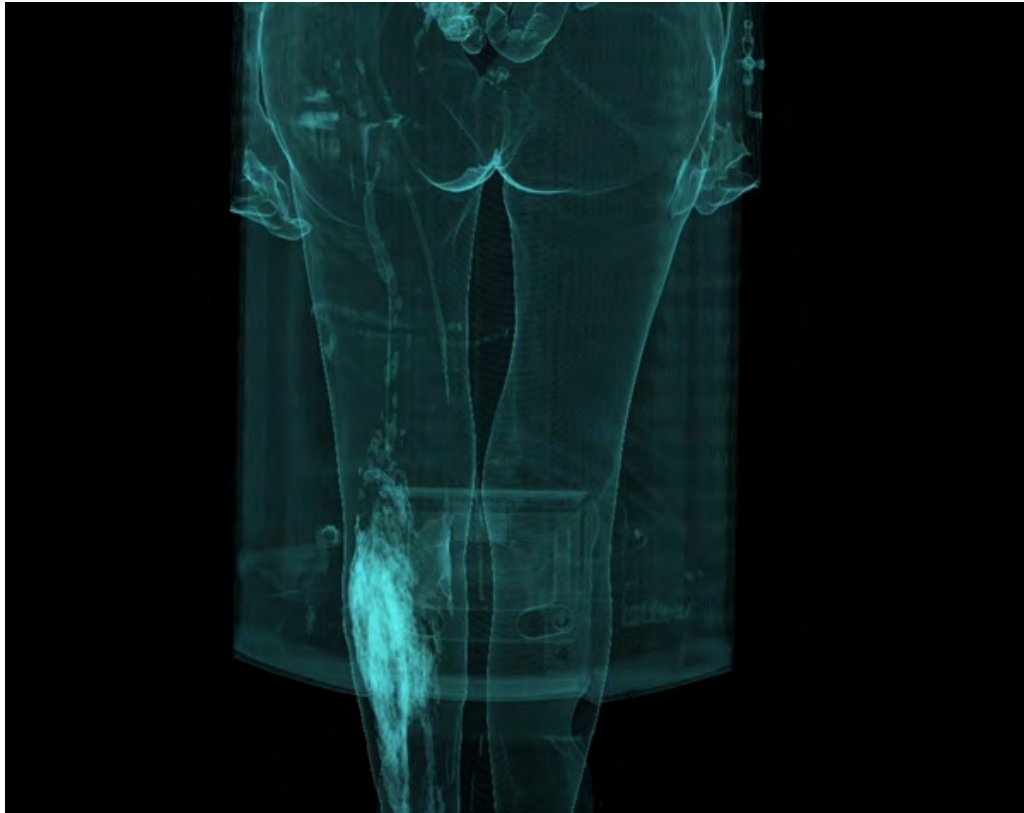


Figure 1: Computed tomographic reconstruction showing gas collection in fascial planes and subcutaneous tissues

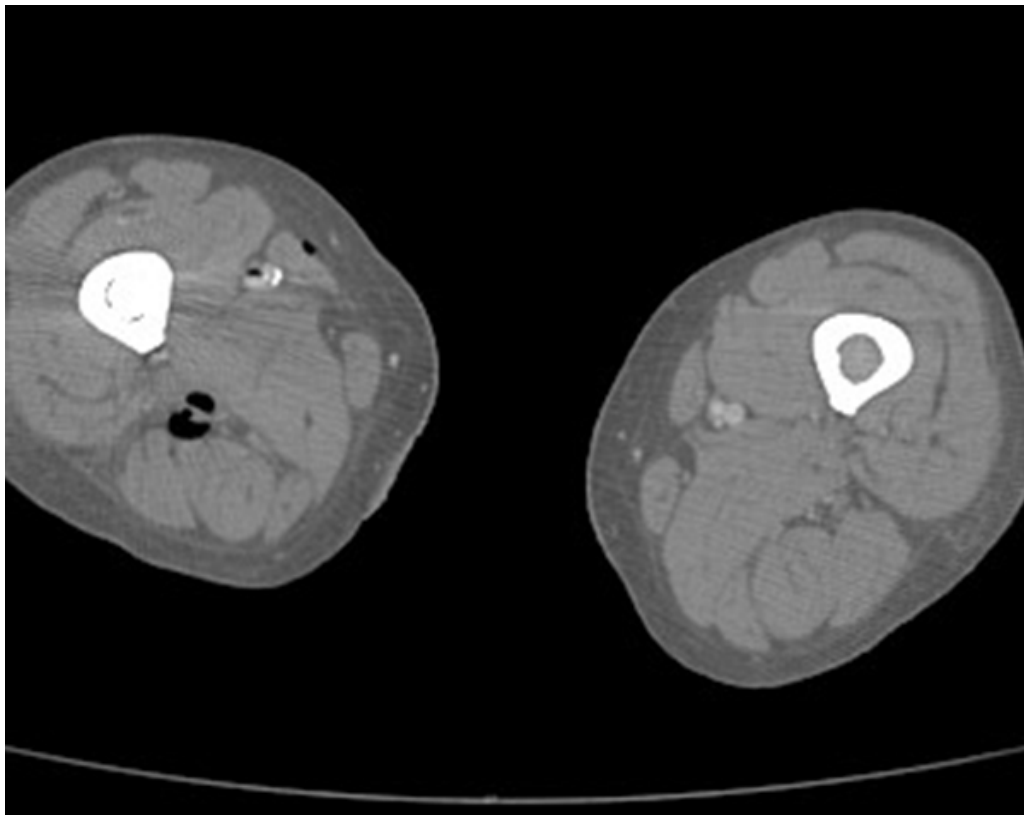


Figure 2: Cross-sectional image of computed tomography scan showing compression of arteries of the right lower limb by gas



Figure 3: Sagittal image of computed tomography scan revealing air bubbles in the iliac-femoral vein axis

5. Discussion

Several factors have been found to increase the risk of developing NF leading to sepsis and septic shock, including malignant tumours [1, 2]. Mortality is very high (25-35%) despite the increased awareness of the disease over the last decade and the outlined therapeutic techniques [3]. Whereas venous gas emboli is a known condition associated with surgical procedures, e.g. hysteroscopic surgery [8] and pathologies, e.g. emphysematous cystitis [4], no case of presence of gas in the deep venous system associated with necrotizing fasciitis presenting as acute limb ischemia has been reported in literature. Conditions predisposing the entry of gas into the venous system include the presence of gas surrounding the vessels, thus creating a pressure gradient between the point of entry in the veins and the right side of the heart [1, 5]. Patients usually present with a typical triad of symptoms: pain disproportionate to the clinic, edema and fever. Other symptoms such as erythema, subcutaneous crepitus, skin necrosis and hypotension are often associated. The more the infection evolves, the more pain, edema and erythema with indistinct edges are emphasized; the skin has a

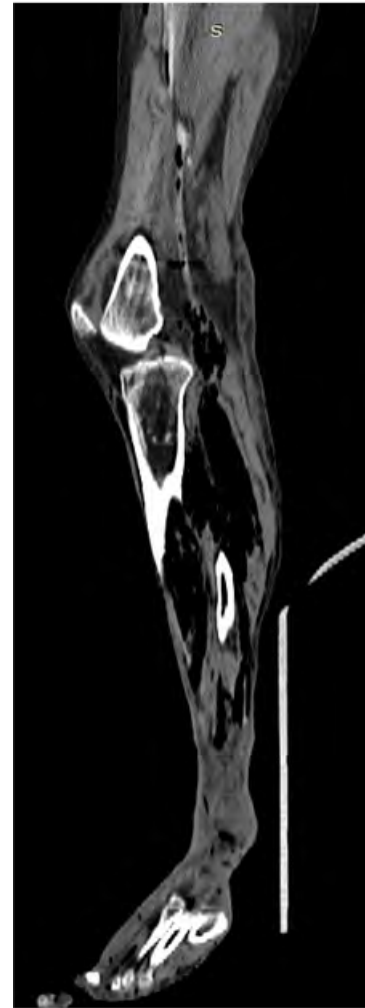


Figure 4: Coronal computed tomography image providing evidence of gas in the iliac-femoral vein axis

purplish tinge and bubbles with serous content, up to the development of hematomas and gangrenous lesions [1, 6]. The most isolated pathogen is Group A Streptococcus; its exotoxins determine the activation of an immune-mediated response with a rapid worsening of the clinical picture and evolution towards septic shock [1, 7]. Moreover, bacterial exotoxins directly cause microvascular damage, which, in association with coagulation disorders and thrombosis, can lead to ischemia of the involved tissues. Patients with exaggerated inspiratory effort, anaemia or shock are expected to be at higher risk of gas entry in the circulation [8, 9]; generally, a small amount of air is absorbed spontaneously by the venous circulation, but when a larger amount enters the circulation rapidly, it can cause death. A fatal amount of air is defined as 200-300ml or 3-5ml/kg in adults [10, 11]. The presence of damage to the microcirculation caused by streptococcal exotoxins, vasodilation and increased vascular permeability associated with the infection [12, 13], further assisted by the patient's expired clinical conditions, could have determined the passage of gas from the tissues affected by NF to the venous and arterial circulation of the leg [14 -16].

6. Conclusion

NF is a severe pathological condition that can evolve rapidly, leading to the death of the patient both for the progression of the infection and the consequent septic shock and for any associated comorbidities, such as gas embolism. Prompt therapy is essential and aimed at fighting not only the infection but also its possible complications.

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