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Bilateral Necrotizing Soft Tissue Infection Caused by *Pseudomonas aeruginosa* in a Renal Transplantation Recipient

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Authors' contributions

This work was carried out in collaboration between both authors. Author CDC provided the case, the figures, managed the literature search and wrote the draft. Author GD supervised the work and contributed of the correction of the draft. Both authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Background: Necrotizing soft tissue infection caused by *Pseudomonas aeruginosa* in monomicrobian culture is rare.
Aim: We present the case of a bullous bilateral form of *Pseudomonas aeruginosa* necrotizing skin infection in a renal transplantation recipient.
Presentation of Case: A 40 year old female previously treated in a dermatology clinic was admitted for bilateral leg pain and cutaneous ulcers. Investigations led to the diagnosis of necrotizing soft tissue infection. Antimicrobial treatment was started but patient's condition has worsened with the death few days after admission.
Conclusion: The author draws attention to the need for knowledge of disease characteristics, multidisciplinary team approach and aggressive treatment.

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Keywords: Pseudomonas aeruginosa; necrotizing soft tissue infection.

1. INTRODUCTION

Necrotizing soft tissue infections are recognized as serious, life- threatening condition that requires immediate intensive treatment. [1,2] establishing the diagnosis is a challenge for the physician because the disease has no pathognomonic lesions at onset.

We present the case of a renal transplantation patient with necrotizing skin infection caused by *Pseudomonas aeruginosa* and a brief review of diagnosis and therapeutic measures imposed by this condition.

2. PRESENTATION OF CASE

A 40 years female was admitted with a history of fever, pain in legs and cutaneous ulcers, bilateral edema, dyspnea. The disease started about 1 month before admission with lower limb erythematous lesions. She was treated in a dermatology department with amoxicillin and one ointment that the patient could not specify but the lesion extended and skin ulceration occurred. Due to high fever and the emergence of dyspnea and oliguria the patient was transferred in the Department of Nephrology.

Her medical history included chronic glomerulonephritis, 9 years of hemodialysis, renal transplantation from a living donor at the age of 35. Her post-transplant course was complicated by chronic allograft nephropathy. The current immunosuppressive regimen consisted of cyclosporine, mycophenolate and prednisone, with cyclosporine level within the therapeutic range.

Clinical examination on admission revealed a pale skin, fever (39 degrees Celsius), blood pressure 180/100 mmHg and oliguria.

On the dorsum of the left foot she had a large bullous lesion with serum content which broke leaving underneath a large skin ulcer with irregular borders, exposing the underlying muscle tissue. (Figs.1,2) extended skin ulcers with irregular margins and tissue necrosis were present on both legs (Fig. 3).

The patient refuses supine because severe rest pain over the involved skin.

On admission laboratory tests revealed: leukocytes 15.9 x 10^9/L with 90% neutrophyles, hemoglobin value 53 g / L, platelets 900 x 10^9/L, C reactive protein 200 mg / L, fibrinogen 18.93 mmol / L, serum creatinine 227 mmol / L, blood urea 78 mmol / L, serum natrium 125 mmol / L, parathormone value 894 ng / L, serum calcium 2.32 mmol / L, normal AST, ALT, serum bilirubin and lactate dehydrogenase. Antinuclear, anti-double-stranded-DNA, anticardiolipin antibodies, cryoglobulins and urine bacteriologic exam were negative. Repeated bacterial culture of the wound showed the presence of *Pseudomonas aeruginosa* (monomicrobial culture) susceptible to carbapenems and levofloxacin. *Pseudomonas aeruginosa* (monomicrobial culture) with the same antimicrobial susceptibility pattern was isolated also in the fluid aspirated from bullae. Only one blood culture was collected prior to antimicrobial administration and this one failed to isolate any organisms. A skin biopsy was timed because of patient refusal. Deep vein thrombosis was excluded by Doppler exam. Ankle X-ray showed extensive arterial calcifications.

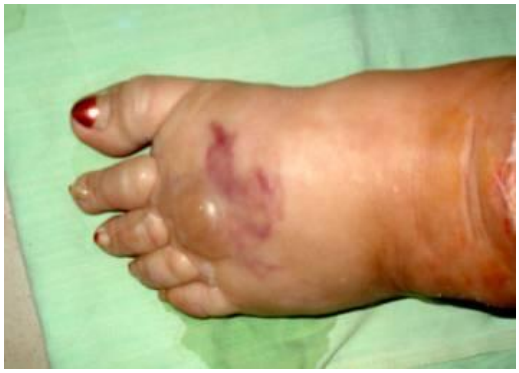

Fig. 1. Tense bullous lesion and a purplish red discoloration of the skin (at the onset) with *Pseudomonas aeruginosa* in the fluid aspirated from bullae

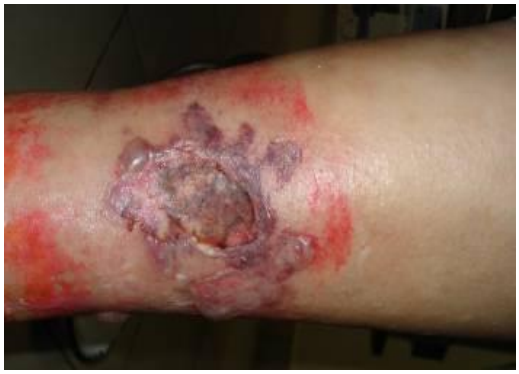

Fig. 2. Bullous lesion with serum content which broke leaving underneath a skin ulcer with irregular borders

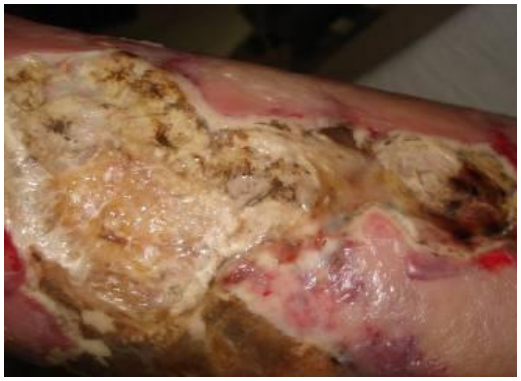

Fig. 3. Skin ulcer with irregular borders and areas of necrosis

Empiric antimicrobial treatment with meropenem at a dose of 1000 mg every 8 hours was started immediately after admission. Fever was maintained during hospitalization; after three days the patient condition deteriorated with anuria, aggravation of nitrogen retention, worsening of left ventricular failure phenomena. The decision to start hemodialysis was made but the patient refused the procedure. She requested discharge from the hospital and oral antimicrobials. Four days later the patient called emergency services for fever, dyspnea and anuria. Death occurs 8 hours after admission, during hemodialysis.

3. RESULTS AND DISCUSSION

Necrotizing soft tissue infections (NSTI) are rare but serious acute infection of any of the layers within the soft tissue compartments associated with necrotizing changes [3].

Organisms can enter through any break in the skin barrier but the disease can occur without a specific event. Self inoculation is also possible as well as dissemination of the infection to other sites of the body. Bilateral involvement is possible, but extremely rare [4].

Necrotizing soft tissue infections are classified into three types according to the causative organism: Types 1 are polymicrobial infections (mixed aerobic / anaerobic bacteria), types 2 are monomicrobial (usually Group A beta-haemolytic Streptococcus or *Staphylococcus sp.*).

Pseudomonas soft tissue infection are reported in the literature in patients with impaired immunity but also in healthy subjects [5,6,7]. All age groups can be affected.

NSTI's clinical manifestations are very different depending on the interaction of bacteria with host immunity. Some authors demonstrated that chronic renal failure is a risk factor for the disease but also for a worse prognosis in monobacterial necrotizing fasciitis [8].

Because of the paucity of distinct changes, establishing the diagnosis is a real challenge for the physician. Bullous skin lesions are possible; they are produced by toxin-mediated epidermal cleavage. Severe pain is common, often out of proportion to the degree of dermal involvement; it can be explained by the damage of the deep layers of skin produced by bacterial toxin [9]. Skin necrosis is explained by microvascular changes caused by the release of bacterial endo- and exotoxins.

Several features can advocate for the necrotizing form of the disease: tense edema extended beyond the area of skin erythema, wooden-hard feel of the subcutaneous tissues, gas in the soft tissues, detected by palpation, etc [10].

Systemic manifestation as fever, tachycardia and shock may develop and findings like elevated C reactive protein, low hemoglobin and serum natrium helps to discriminate between necrotizing and non-necrotizing soft tissue infections [11,12].

When "hard" clinical signs are not available, computer tomography (showing abnormal soft tissue gas), magnetic resonance imaging with intravenous gadolinium contrast, tissue biopsy, microbiologic culture of soft tissue and fine-needle aspiration and culture of aspirate may be useful for the diagnosis [13].

In the study of Zacharias et al, the sensitivity of computer tomography to identify necrotizing soft tissue infection was high (100%) but specificity was low (81%) [14].

A wide range of diseases must be considered in the differential diagnosis: Infectious (ecthyma gangrenosum, pyoderma gangrenosum etc), vascular (calciphylaxis, venous insufficiency dermatitis, deep vein thrombosis, etc.), hematological (cutaneous graft versus host disease), metastatic (carcinoma erysipeloides), drug reactions, insect bite, etc [15,16,17].

Treatment involves early and extensive surgical debridement of the necrotic tissue as an essential step in order to limit the spread of infection;

repeated procedures may be needed for the same patient [12,13].

Broad spectrum antibiotics (monotherapy with carbapenems or multidrug regimens for coverage of gram-positive and gram-negative organisms) should be started early and should be continued until no further surgical procedures are needed and the patient status is better [18].

Close monitoring in intensive care units is encouraged because fluid resuscitation combined with adequate nutrition and organ support should be initiated early.

Hyperbaric oxygen therapy was suggested to improve microcirculation and was used with conflicting results, so the role in the therapy is uncertain [19].

Necrotizing soft tissue infections are aggressive; systemic sepsis and fatal multiple organ system failure can occur. Some authors calculated an overall mortality for necrotizing soft tissue infection of 53%, but the case fatality is 100% if untreated [20].

The case presented is particularly due to the bilateral nature of the lesions and also because the existence of Pseudomonas in monomicrobial culture in the fluid taken from the bullae.

During hospitalization in our department debridement was not possible due to patient refusal to accept any invasive therapeutic measure.

It can be concluded that a more aggressive approach (surgical and medical) from the beginning would have changed the course of the disease. Bilateral nature of the lesions and the imunosuppresive treatment were bad prognosis criteria. c.

4. CONCLUSION

Our case highlights the need for careful monitoring of any infectious skin lesions, for a multidisciplinary approach and for aggressive early therapeutic measures.

Considering the bad prognosis of NSTIs, the authors find it necessary to increase awareness of physician on the disease, multidisciplinary team approach, aggressive wound care and antibiotherapy in order to reduce the mortality of the disease.

CONSENT

The patient has not provided permission to publish these features of his / her case as her disease progressed to death, but the identity of the patient has been protected. Permission was given by a relative of the patient.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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