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CASE REPORT

Erythema *induratum* secondary to *Pseudomonas aeruginosa* bacteremia in an elderly patient: a rare case report

Eritema induratum secundário a bacteriemia a Pseudomonas aeruginosa em doente idoso: relato de um raro caso clínico

Mélissa M. de Carvalho[1]*, *Margarida M. Valejo-Coelho*[1], *and Rita Sampaio*[2]

[1]*Department of Dermatology and Venereology;* [2]*Department of Pathology. Hospital de Egas Moniz, Lisbon, Portugal*

Abstract

Erythema *induratum* (EI) is a rare form of panniculitis, often associated with tuberculosis but which can be linked to other infections or idiopathic. We report a case of an atypical presentation of EI secondary to *Pseudomonas aeruginosa* bacteremia. An 84-year-old man with chronic kidney disease on hemodialysis was admitted for left leg cellulitis and *Pseudomonas aeruginosa* bacteremia. Despite antibiotic therapy, he developed nontender, erythematous nodules on his left leg. Histopathology revealed a mixed-pattern panniculitis consistent with EI. Targeted antibiotic therapy led to overall improvement. EI typically presents in adult women and rarely in elderly men. Differential diagnosis included infectious panniculitis, erythema *nodosum* and ecthyma *gangrenosum*. Negative microorganism stainingand a favorable antibiotic response confirmed the diagnosis. This case highlights a rare association of EI with infection by *P. aeruginosa* and emphasizes the importance of comprehensive diagnostic evaluation in atypical clinical presentations.

Keywords: Erythema *induratum*. *Pseudomonas aeruginosa*. Nodular vasculitis. Panniculitis.

Resumo

O eritema *induratum*é uma forma rara de paniculite, frequentemente associada à tuberculose, mas que também pode ser secundária a outras infeções ou ser idiopática. Apresentamos um caso de uma manifestação atípica de eritema *induratum*-secundário a bacteriemia por *Pseudomonasaeruginosa*. Um homem de 84 anos, com doença renal crónica sob hemodiálise, foi internado por celulite da perna esquerda e bacteriemia a *Pseudomonasaeruginosa*. Apesar da terapêutica antibiótica, desenvolveu nódulos eritematosos e indolores na perna esquerda. A histopatologia revelou um padrão misto de paniculite, consistente com o diagnóstico de eritema *induratum*. A terapêutica antibiótica direcionada levou a uma melhoria global do quadro clínico. O eritema *induratum*apresenta-se tipicamente em mulheres adultas, sendo raro em homens idosos. O diagnóstico diferencial incluiu paniculite infeciosa, eritema nodoso e ectima gangrenoso. A coloração negativa para microrganismos e a resposta favorável à terapêutica antibiótica confirmaram o diagnóstico. Este caso destaca uma associação rara entre o eritema *induratum*e infeção por *Pseudomonas aeruginosa*, sublinhando a importância de uma avaliação diagnóstica abrangente em apresentações clínicas atípicas.

Palavras-chave: Eritema *Induratum*. *Pseudomonas aeruginosa*. Vasculite nodular. Paniculite.

Correspondence:
Mélissa M. de Carvalho
E-mail: mmecarvalho@ulslo.min-saude.pt

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Introduction

Erythema *induratum* (EI), also known as nodular vasculitis, is a rare form of panniculitis characterized by erythematous nodules typically located on the lower limbs. Initially described as a hypersensitivity reaction to *Mycobacterium tuberculosis* (EI of Bazin)[1,2], EI can also be associated with other diseases, drugs, or be idiopathic[2].

This case report describes an unusual presentation of EI secondary to *Pseudomonas aeruginosa* bacteremia in an elderly patient with multiple comorbidities. This is a unique presentation that highlights the diverse etiologies of EI and the diagnostic challenges it presents.

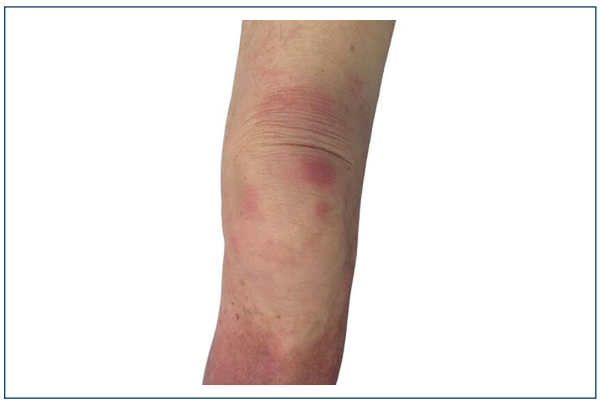

Figure 1. Physical examination revealing edema, slight erythema, and five nontender, erythematous, centimetric nodules distributed in a sporotrichoid pattern on the anterior aspect of the upper third of the left leg and knee.

Case presentation

An 84-year-old man with a history of chronic kidney disease on hemodialysis, cerebrovascular disease, atrial fibrillation, hypertension, hyperuricemia, and diabetes was admitted to the Nephrology Department due to left leg cellulitis and bacteremia caused by *Pseudomonas aeruginosa*.

After six days of hospitalization under targeted antibiotic therapy, dermatology was consulted due to persistent inflammatory lesions on the affected limb. Examination revealed edema, slight erythema, and increased local temperature, with five nontender, erythematous, centimetric nodules distributed in a sporotrichoid pattern on the anterior aspect of the upper third of the left leg and knee (Fig. 1). Differential diagnosis included infectious panniculitis and erythema *nodosum*.

A deep skin biopsy of one nodule was performed. Histopathological examination (Fig. 2) revealed a mixed-pattern panniculitis, with a marked mixed inflammatory infiltrate, multiple neutrophils, abscess formation, multinucleated giant cells, leukocytoclasia, cytosteatonecrosis, focal granuloma formation, and some vessels with fibrinoid necrosis, with negative staining for bacteria, mycobacteria and fungi, favoring the diagnosis of EI.

Complementary investigation for etiological study revealed elevated inflammatory markers (erythrocyte sedimentation rate of 68 mm/1st hour, c-reactive protein 3.25 mg/dL), a normal chest X-ray, negative serologies for human immunodeficiency virus, syphilis, hepatitis B and C, and a negative interferon-gamma release assay (IGRA) test.

The diagnosis of EI of Whitfield (or nodular vasculitis) secondary to *P. aeruginosa* infection was made. The patient showed overall improvement with targeted antibiotic therapy, including 17 days of piperacillin/tazobactam and 14 days of amikacin. The skin nodules ulcerated, giving place to painless superficial ulcers, with good response to local wound care.

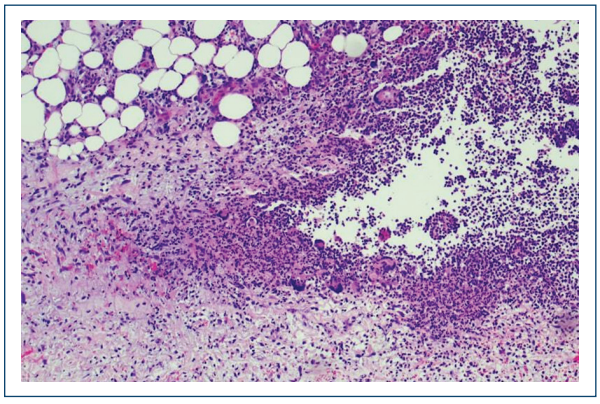

Figure 2. Histopathological examination (hematoxylin & eosin, 100x) of a deep skin biopsy revealing a mixed-pattern panniculitis, with a marked mixed inflammatory infiltrate, multiple neutrophils, abscess formation, multinucleated giant cells, leukocytoclasia, cytosteatonecrosis, focal granuloma formation, and some vessels with fibrinoid necrosis.

Given the absence of symptoms associated with the skin lesions, the good response to local treatment, and the resolution of the associated infection, the patient remains under clinical surveillance and complete healing is expected.

Discussion

Erythema *induratum* is traditionally classified into three subtypes: associated with tuberculosis (Bazin

Table 1. Summary of the reported cases of infectious panniculitis secondary to *Pseudomonas aeruginosa*

Author and year	Patient's gender and age	Clinical presentation
Gosnell H et al. 2021	Male, 57 years	Diffuse, erythematous subcutaneous nodules, and several necrotic ulcerations surrounded by erythematous halos, on the abdomen, upper, and lower extremities
Yendo et al. 2022	Female, 44 years	Erythematous nodules on the upper back, chest, face, arms, and breasts
Penz et al. 2010	Female, 72 years	Ulcers on the right leg and a nodule on the right thigh
Moyano et al. 2011	Female, 63 years	Erythematous nodules, some with pustules on the surface
Bagel et al. 1986	Female, 56 years	Erythematous subcutaneous nodules, pustules, and hemorrhagic blisters on the extremities
Patterson et al. 1989	ND	No information available
Roriz et al. 2014	Female, 80 years	Multiple ulcers on the right lateral malleolus and inflammatory nodules on the left thigh
Roriz et al. 2014	Male, 50 years	Inflammatory nodules on the left leg, with some infracentimetric cutaneous ulcers
Roriz et al. 2014	Female, 70 years	Inflammatory nodules on the right limb
Aleman et al. 1999	ND	Erythematous subcutaneous nodules on the posterior surface of the right leg
Picard et al. 2011	Female, 82 years	Multiple painful red-purple nodules on the right leg and inguinal lymphadenopathy
Saito et al. 2024	Male, 11 months	Erythema in the right abdomen and left lower leg

type), associated with other diseases or drugs (Whitfield type), and idiopathic. Latent or active tuberculosis is the most commonly reported identifiable cause[1,2]. Differentiation between these subtypes relies on clinical history, physical examination and complementary investigations, as clinical and histological findings alone are indistinguishable[2].

Erythema *induratum* typically affects adult women and presents with subcutaneous erythematous nodules on the posterior aspect of the lower legs, which can ulcerate and heal with scarring and lipoatrophy[1,2]. Systemic symptoms are generally absent[2]. Diagnosis requires an incisional biopsy for histopathological and microbiological examination to exclude infectious panniculitis[2,3].

The histopathological hallmark of EI is a lobular panniculitis with necrosis and a mixed granulomatous infiltrate with vasculitis[1,2]. The inflammatory infiltrate is mixed, containing lymphocytes, plasma cells, histiocytes, neutrophils, and eosinophils, with extravascular foci of fibrinoid necrosis[2,4]. The vasculitis may involve various vessel types in the subcutaneous septa and/or lobules[2].

Treatment primarily involves addressing the underlying disease, together with symptomatic treatment including nonsteroidal anti-inflammatory drugs, rest, elevation, and compression[1,2]. Successful treatment of the underlying condition usually leads to the resolution of EI[1,2,4].

In the described clinical case, the leg nodules subsided along with the improvement of the systemic infection following antibiotic administration, suggesting that EI was caused by *P. aeruginosa* infection. This diagnosis was supported by the negative IGRA test and negative microbiological stains, excluding tuberculosis and infectious panniculitis, respectively. However, the location of the nodules on the anterior leg and knee, and the fact that the patient was an elderly man, are atypical for this diagnosis, posing a diagnostic challenge.

The main differential diagnosis considered was infectious panniculitis secondary to *P. aeruginosa*, a rare cause. In our case, despite negative histopathological stains, skin cultures were not performed. Another important differential diagnosis to consider in the context of *Pseudomonas bacteremia*was ecthyma *gangrenosum*, but the absence of blister formation or necrotic ulcers ruled out this option.

The patient shows a favorable clinical evolution, with resolution of the underlying infection, progressive healing of the leg ulcers, and no recurrence of nodules.

Literature reports 12 cases[3,5-9] of infectious panniculitis secondary to *P. aeruginosa* (Table 1). However, to

our knowledge, this is the first reported case of EI secondary to P. aeruginosa, and it's therefore important to highlight the clinical presentation and management of this rare cause of EI.

Conclusion

This case report emphasizes the importance of considering EI in the differential diagnosis of inflammatory skin lesions in patients with *P. aeruginosa* bacteremia. Comprehensive clinical evaluation, histopathological examination and exclusion of common infectious agents are crucial for accurate diagnosis and management. The successful resolution of the patient's skin lesions with appropriate antibiotic therapy highlights the importance of treating the underlying cause in EI. This case adds to the limited literature on nontuberculous etiologies of EI and emphasizes the need for awareness of its diverse presentations and etiologies.

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Conflicts of interest

None.

Ethical considerations

Protection of humans and animals. The authors declare that no experiments involving humans or animals were conducted for this research.

Confidentiality, informed consent, and ethical approval. The authors have followed their institution's confidentiality protocols, obtained informed consent from patients, and received approval from the Ethics Committee. The SAGER guidelines were followed according to the nature of the study.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

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