



(CASE REPORT)



Pyogenic liver abscess caused by *Pseudomonas aeruginosa*: A rare case diagnosed in the microbiology department of Avicenne Military Hospital, Marrakech

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Abstract

Pyogenic liver abscesses are severe infectious diseases associated with significant morbidity and mortality. *Enterobacteria* remain the most common causative microorganisms, whereas *Pseudomonas aeruginosa* is rarely involved, particularly in community-acquired infections. We report a rare case of pyogenic liver abscess caused by *Pseudomonas aeruginosa*, diagnosed in the Microbiology Department of Avicenne Military Hospital of Marrakech. A 62-year-old diabetic male was admitted with fever, right upper quadrant abdominal pain, asthenia, and altered general condition. Laboratory investigations revealed marked inflammatory syndrome, leukocytosis, and hepatic cytolysis. Abdominal computed tomography demonstrated a multiloculated abscess in the right hepatic lobe. Percutaneous drainage was performed, and microbiological analysis of the aspirated pus isolated *Pseudomonas aeruginosa*. Antimicrobial susceptibility testing revealed susceptibility to piperacillin-tazobactam, ceftazidime and cefepime, associated with resistance to carbapenems, suggestive of OprD porin alteration phenotype. The patient received adapted intravenous antibiotic therapy associated with radiological drainage, resulting in favorable clinical and biological evolution. This observation highlights the importance of microbiological documentation in pyogenic liver abscesses and emphasizes the essential role of the microbiology laboratory in optimizing antimicrobial therapy and improving patient outcome.

Keywords: Pyogenic liver abscess; *Pseudomonas aeruginosa*; Carbapenem resistance; OprD porin alteration; Antimicrobial susceptibility; Case report

1. Introduction

Pyogenic liver abscess (PLA) is a potentially life-threatening infection characterized by suppurative destruction of hepatic parenchyma [1]. Despite advances in imaging techniques, interventional radiology, and antimicrobial therapy, pyogenic liver abscesses continue to be associated with substantial morbidity and mortality, especially in elderly or immunocompromised patients [2].

The epidemiology of pyogenic liver abscesses has evolved over recent decades. Traditionally, enteric Gram-negative bacilli such as *Escherichia coli* were considered the predominant pathogens [3]. More recently, *Klebsiella pneumoniae* has emerged as an important etiological agent in several regions worldwide [4]. In contrast, *Pseudomonas aeruginosa* remains an uncommon cause of hepatic abscesses and is usually associated with healthcare-related infections, biliary tract abnormalities, diabetes mellitus, prolonged hospitalization, or previous invasive procedures [5].

Pseudomonas aeruginosa is an opportunistic pathogen known for its remarkable intrinsic resistance and capacity to acquire multiple antimicrobial resistance mechanisms, making therapeutic management particularly challenging [6]. Early microbiological diagnosis is therefore essential for appropriate antimicrobial adaptation.

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We report a rare case of pyogenic liver abscess caused by *Pseudomonas aeruginosa*, diagnosed in the Microbiology Department of Avicenne Military Hospital of Marrakech, and discuss the microbiological and therapeutic aspects of this uncommon infection.

2. Case Presentation

A 62-year-old male patient was admitted to the Internal Medicine Department of Avicenne Military Hospital of Marrakech for persistent fever associated with chills, right hypochondrial pain, generalized weakness, anorexia, and weight loss evolving for approximately ten days.

The patient had a medical history significant for poorly controlled type 2 diabetes mellitus treated with oral antidiabetic drugs. Diabetes mellitus is considered one of the main predisposing factors for pyogenic liver abscesses because of impaired immune defense mechanisms [2].

On admission, physical examination revealed an altered general condition with fever at 39.2°C, tachycardia at 105 beats/min, and tenderness localized to the right upper abdominal quadrant. No jaundice or signs of peritonitis were noted.

Initial laboratory investigations showed:

- Leukocytosis at 18,500/mm³ with neutrophil predominance
- Elevated C-reactive protein at 245 mg/L
- Erythrocyte sedimentation rate accelerated at 90 mm/h
- Mild hepatic cytolysis with elevated AST and ALT
- Elevated alkaline phosphatase and gamma-glutamyl transferase
- Hyperglycemia with poor glycemic control
- Blood cultures were collected before initiation of antimicrobial therapy.

Abdominal ultrasonography revealed a heterogeneous hypoechoic lesion within the right hepatic lobe suggestive of hepatic abscess formation. Contrast-enhanced computed tomography confirmed the presence of a multiloculated abscess measuring approximately 7 cm in segment VIII of the liver with peripheral enhancement and surrounding inflammatory changes [7].

The patient underwent ultrasound-guided percutaneous drainage, and the purulent specimen was immediately transported to the Microbiology Department of Avicenne Military Hospital of Marrakech for bacteriological analysis.

Direct microscopic examination after Gram staining revealed numerous polymorphonuclear leukocytes associated with abundant Gram-negative bacilli, strongly suggestive of an active bacterial infection. This initial examination played an essential role in orienting the diagnosis and guiding the first therapeutic approach.

The specimen was cultured on ordinary bacteriological media including blood agar, chocolate agar, and CLED agar, followed by incubation under appropriate aerobic conditions. After incubation, culture yielded abundant growth of large colonies with characteristic pigmentation producing pyocyanin, highly suggestive of *Pseudomonas aeruginosa*. The isolate was oxidase-positive.

Bacterial identification was initially based on conventional microbiological characteristics including colony morphology, pigment production, Gram staining appearance, and oxidase reaction. Identification was subsequently confirmed using the automated identification system available in the laboratory.

The antibiogram demonstrated susceptibility to piperacillin-tazobactam, ceftazidime, cefepime, amikacin, ciprofloxacin associated with resistance to carbapenems. The phenotypic profile was suggestive of OprD porin alteration, a well-described mechanism of carbapenem resistance in *Pseudomonas aeruginosa*.

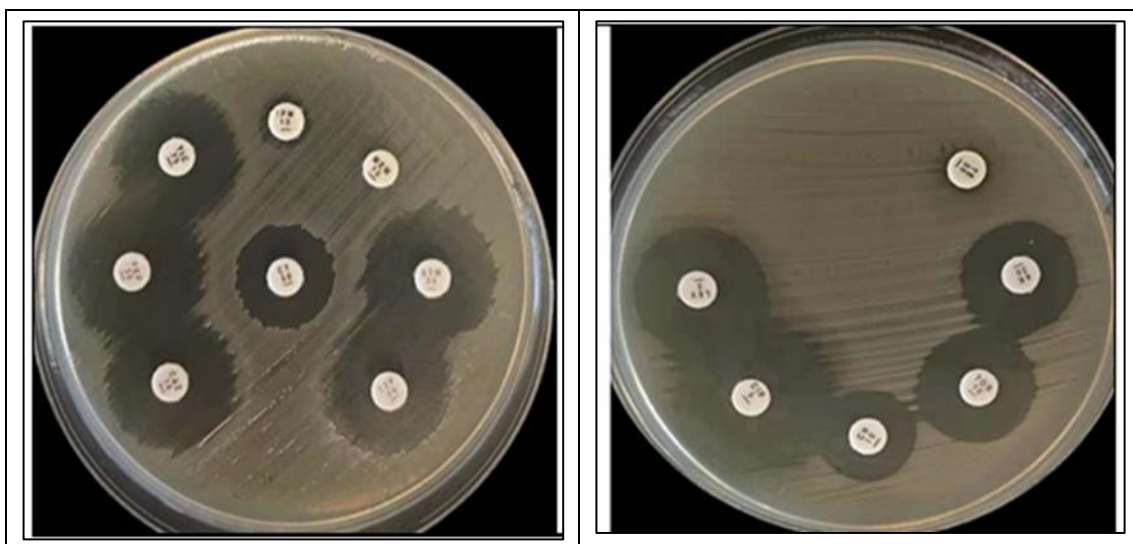


Figure 1 Antibiogram of *Pseudomonas aeruginosa* isolate demonstrating carbapenem resistance

The microbiological approach combining direct examination, conventional culture, manual susceptibility testing, and automated identification constituted a fundamental step for establishing the etiological diagnosis and optimizing targeted antimicrobial therapy. Blood cultures remained sterile.

Empirical antimicrobial therapy initially started with ceftriaxone and metronidazole was subsequently modified according to the susceptibility profile to intravenous piperacillin-tazobactam. Percutaneous drainage was maintained for several days with progressive reduction of purulent output.

Clinical evolution was favorable with rapid defervescence, regression of abdominal pain, normalization of inflammatory markers, and improvement of general condition. Follow-up imaging performed two weeks later demonstrated marked regression of the hepatic collection.

The patient was discharged after clinical stabilization with continuation of adapted antibiotic therapy and regular outpatient follow-up.

3. Discussion

Pyogenic liver abscesses remain relatively uncommon but potentially severe infections requiring prompt diagnosis and multidisciplinary management [1]. Their pathogenesis generally involves biliary dissemination, portal venous spread, hematogenous seeding, or direct extension from neighboring infectious foci [3].

The microbial etiology varies according to geographical distribution, patient comorbidities, and healthcare exposure. While enterobacteria and anaerobic bacteria are the predominant pathogens, *Pseudomonas aeruginosa* represents an unusual etiological agent [5].

Several predisposing factors associated with *Pseudomonas aeruginosa* liver abscesses have been described in the literature, including diabetes mellitus, immunosuppression, malignancy, prolonged hospitalization, broad-spectrum antibiotic exposure, and biliary tract manipulations [6]. In our patient, diabetes mellitus likely contributed to susceptibility to infection through impaired immune response and altered host defenses.

Clinical manifestations are often nonspecific and include fever, abdominal pain, chills, asthenia, and inflammatory syndrome [2]. Biological abnormalities usually reveal leukocytosis and elevated inflammatory markers, while liver function tests may demonstrate cholestatic or cytolytic patterns.

Radiological imaging plays a crucial role in diagnosis. Ultrasonography is often the first-line examination, whereas computed tomography provides better sensitivity for characterization, localization, and assessment of abscess extension [7].

In the present case, the resistance profile was suggestive of OprD porin alteration, a resistance mechanism leading to reduced carbapenem permeability, particularly affecting imipenem susceptibility. This mechanism is frequently described in *Pseudomonas aeruginosa* and represents an important therapeutic concern because it may limit the use of carbapenems while preserving susceptibility to other antipseudomonal β -lactams.

Microbiological documentation remains fundamental for accurate etiological diagnosis and therapeutic optimization [6]. Direct examination and culture of aspirated pus allow identification of causative organisms and determination of antimicrobial susceptibility profiles. In the present case, isolation of *Pseudomonas aeruginosa* had important therapeutic implications because of the species' well-known intrinsic resistance mechanisms and its ability to acquire multidrug resistance.

The microbiological aspect of this observation was particularly interesting. The characteristic pyocyanin-producing colonies, oxidase positivity, and Gram-negative bacilli observed on direct examination strongly supported the diagnosis of *Pseudomonas aeruginosa*. The combination of conventional bacteriological methods with automated identification and susceptibility testing enabled rapid confirmation of the etiological agent and optimization of therapeutic management.

Management of pyogenic liver abscesses relies on a combination of effective antimicrobial therapy and drainage procedures [1]. Percutaneous radiological drainage has become the preferred therapeutic approach in most cases due to its minimally invasive nature and high success rate [7]. Surgical drainage is generally reserved for multiloculated abscesses, rupture, or failure of percutaneous treatment.

The prognosis of pyogenic liver abscesses has significantly improved over recent decades due to advances in diagnostic imaging, microbiological techniques, and antibiotic therapy [3]. Nevertheless, delayed diagnosis or inappropriate antimicrobial treatment may lead to severe complications including septic shock, rupture, and metastatic infections.

This observation underlines the indispensable role of the microbiology laboratory in establishing the diagnosis, detecting resistance mechanisms, and guiding targeted antimicrobial therapy.

4. Conclusion

Pyogenic liver abscess caused by *Pseudomonas aeruginosa* is an uncommon but potentially severe infection. This case highlights the importance of considering unusual pathogens in diabetic or immunocompromised patients presenting with hepatic abscesses. Early microbiological diagnosis associated with appropriate antimicrobial susceptibility testing is essential for therapeutic adaptation and favorable clinical outcome. Close collaboration between clinicians, radiologists, and microbiologists remains crucial for optimal management.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

Statement of ethical approval

This work was conducted in accordance with institutional ethical standards. Patient confidentiality and anonymity were fully respected throughout the study.

Statement of informed consent

Written informed consent was obtained from the patient for publication of this case report and accompanying clinical data.

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