Pyogenic Liver Abscess, Brain Abscess, and Culture-Negative Infective Endocarditis: A Diagnostic Challenge in a Multimorbid Patient

Jazba Yousaf[1]*, Atef Michael[2], Folasade Ijaola[3], Shams ud Duja[4]

[1] Senior House Officer, Department of Geriatric Medicine, Dudley Group of Hospitals NHS FT, Dudley UK. Email: jazba.yousaf@nhs.net
[2] Consultant Physician, Department of Geriatric Medicine, Dudley Group of Hospitals NHS FT, Dudley UK. Email: atef.michael@nhs.net
[3] Consultant Physician, Department of Geriatric Medicine, Dudley Group of Hospitals NHS FT, Dudley UK. Email: folasade.ijaola@nhs.net
[4] Consultant Physician, Department of Geriatric Medicine, Dudley Group of Hospitals NHS FT, Dudley UK. Email: shams.duja@nhs.net

Abstract

We present the case of a 71-year-old male who developed pyogenic liver abscesses, multiple brain abscesses, and suspected culture-negative infective endocarditis (IE). This case highlights the diagnostic complexity and therapeutic challenges encountered in the management of disseminated infections in a patient with significant comorbidities. It underscores the importance of maintaining a high clinical suspicion for IE despite negative blood cultures and inconclusive echocardiographic findings. The case is used to explore key diagnostic reasoning, antimicrobial choices, and learning points relevant to trainees.

Keywords: Infective Endocarditis, Pyogenic Liver Abscess, Brain Abscess, Culture-Negative, Sepsis, Ventriculitis, Antibiotic Therapy.

Case Description

A 71-year-old male with a medical history of hypertension, poorly controlled type 2 diabetes mellitus, and chronic kidney disease presented to the emergency department with a one-week history of fever (up to 39°C), chills, malaise, and generalized weakness. The patient had returned to the UK from Thailand two weeks prior, where he had resided for ten months. He denied any recent insect bites, gastrointestinal symptoms, or known infectious contacts. There was no history of valvular heart disease, intravenous drug use, or prosthetic devices.

On initial examination, the patient was alert but visibly unwell. He was febrile (39°C), tachycardic (112 bpm), and hypotensive (BP 90/60 mmHg). Cardiovascular examination revealed a faint systolic murmur at the left parasternal border. Abdominal examination identified mild tenderness in the right upper quadrant without hepatosplenomegaly. Neurological assessment was unremarkable at presentation, with no focal deficits noted.

Investigations and Initial Management

Initial laboratory tests revealed markedly elevated white blood cell count of 20.9 x 10^9/L, C-reactive protein (CRP) of 162 mg/L, and mildly elevated liver enzymes. A contrast-enhanced CT scan of the abdomen identified multiple hypoattenuating lesions in the liver, consistent with abscesses, with the largest measuring 7.5 x 5 x 5.5 cm. Ultrasound-guided drainage was performed, and purulent fluid grew gram-positive cocci on Gram stain, though cultures remained sterile. Blood cultures, obtained before antibiotics, were also negative.

Empirical intravenous antibiotic therapy with piperacillin/tazobactam was initiated to cover both typical intraabdominal pathogens and potential gram-positive organisms. Given the systemic inflammatory response and presence of liver involvement, infective endocarditis was considered. A transoesophageal echocardiogram (TOE) demonstrated a small mobile echogenic mass on the aortic valve, suggestive but not diagnostic of vegetative endocarditis which carries an increased risk of embolic events and complications [1]

Despite negative blood cultures and equivocal TOE findings, the clinical picture supported the diagnosis of possible infective endocarditis. The patient completed a two-week course of IV piperacillin/tazobactam for liver abscess and

***Correspondence:** Senior House Officer, Department of Geriatric Medicine, Dudley Group of Hospitals NHS FT, Dudley UK. Email: jazba.yousaf@nhs.net

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suspected IE. He showed gradual clinical improvement and was discharged on a 7-day course of oral co-amoxiclav

Figure 1: Liver Abscess.

Clinical Progression

Two weeks post-discharge, the patient re-presented with recurrence of fever (39°C), new-onset confusion, and worsening generalized weakness. Neurological examination revealed new mild right-sided weakness and disorientation to time and place. Urgent CT head showed vasogenic oedema in the right frontal lobe. MRI brain confirmed multiple small ring-enhancing lesions suggestive of abscesses, with evidence of associated ventriculitis and early hydrocephalus.

A repeat TOE did not show any progression of the previously noted aortic valve mass, nor any new valvular abnormalities. Given the radiological findings, clinical context, and recent systemic infection, a diagnosis of metastatic brain abscesses was made, most likely secondary to culture-negative IE.

The patient was commenced on intravenous ceftriaxone. This choice was based on its excellent central nervous system penetration, bactericidal activity, and efficacy against common pathogens implicated in IE, including Streptococcus spp., Staphylococcus aureus, and HACEK organisms.[2,3]. Over two weeks of treatment, the patient improved significantly. Repeat imaging demonstrated resolution of hydrocephalus and a reduction in perilesional oedema. He was transitioned to oral antibiotics for a further 4 weeks and continued to improve clinically.

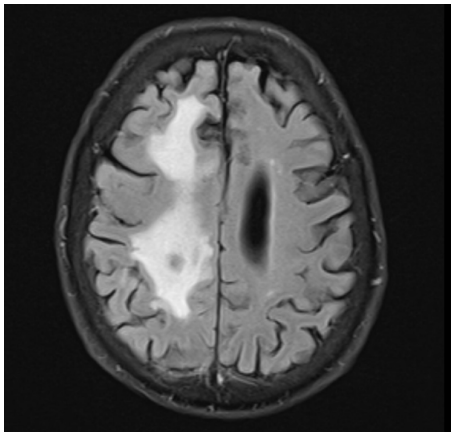

Figure 2: Brain Abscess.

Differential Diagnosis and Diagnostic Reasoning

This case required careful consideration of various differential diagnoses. The triad of liver abscess, brain abscess, and a valvular lesion raised strong suspicion for infective endocarditis with septic embolic spread.[4]. Although blood cultures and TOE were inconclusive, the overall clinical context supported this diagnosis. Alternative diagnoses considered included:

- Melioidosis: Common in Southeast Asia and can present with multiple abscesses. However, serological testing and cultures were negative for *Burkholderia pseudomallei*, and the clinical progression was inconsistent with melioidosis.
- Nocardiosis: May cause disseminated CNS and hepatic abscesses, particularly in immunocompromised hosts. No organisms were identified on modified acid-fast staining or culture.
- Tuberculosis: Considered due to possible endemic exposure; ruled out with negative TB-PCR, AFB stains, and no evidence of granulomatous inflammation.

The mobile valvular mass, systemic symptoms, and multiple abscesses in the absence of another unifying etiology pointed toward culture-negative IE.[5]

Microbiological Considerations

Culture-negative IE presents a significant diagnostic challenge. In this case, it was likely due to:

- Prior antibiotic exposure, which can sterilize blood and abscess cultures.
- Fastidious organisms, such as *Coxiella burnetii*, *Bartonella* spp., and members of the HACEK group, which are difficult to grow in standard cultures.

Advanced diagnostics, including serology for Coxiella and Bartonella, and PCR-based assays on blood or tissue samples, are recommended in such cases. These were not available during the patient's initial admission but are important considerations in similar clinical scenarios.

Treatment Rationale

Initial use of piperacillin/tazobactam was appropriate given the polymicrobial nature of liver abscesses and concern for intra-abdominal sepsis. Upon development of brain abscesses, intravenous ceftriaxone was chosen for its:

- Broad spectrum activity
- Bactericidal properties
- Ability to cross the blood-brain barrier effectively
- Role in treatment of suspected culture-negative IE.[2,3]

This aligns with international guidelines recommending ceftriaxone as a first-line empiric agent in cases of suspected culture-negative IE.[2]

Discussion and Lessons Learned

This case exemplifies the complexities of diagnosing

and managing culture-negative infective endocarditis with metastatic complications.[6] In elderly, multimorbid patients, overlapping symptoms and atypical presentations are common. The presence of liver and brain abscesses, in conjunction with a valvular lesion, should raise suspicion for IE even in the absence of positive cultures.[5]

Key diagnostic challenges included differentiating between primary hepatic or CNS infections versus septic emboli from IE, especially when blood cultures and imaging were inconclusive. This case also reinforces the limitations of conventional microbiology and the growing role of molecular diagnostics.

Multidisciplinary input, including infectious diseases, microbiology, neurology, radiology, and cardiology, was pivotal in managing this patient effectively. Early imaging, appropriate drainage procedures, and empiric broad-spectrum antibiotics tailored to likely pathogens were critical to the favourable outcome.

Learning Points

1. Infective endocarditis should be suspected in patients presenting with multiple abscesses and signs of systemic embolism, even when blood cultures and echocardiography are inconclusive.
2. Culture-negative IE requires consideration of fastidious organisms such as *Bartonella*, *Coxiella*, and HACEK bacteria; serology and molecular diagnostics can be invaluable.
3. Alternative infections (e.g., melioidosis, nocardiosis, tuberculosis) must be considered in patients with relevant travel or exposure history and ruled out systematically.
4. Ceftriaxone is a suitable empiric therapy for culture-negative IE and CNS infections due to its spectrum, CNS penetration, and clinical efficacy.[2,3]
5. A multidisciplinary, imaging-guided, and empirically sound approach is essential for managing disseminated infections in complex patients.

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