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Community-Acquired MRSA Causing Liver Abscess in an Immunocompetent Patient

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ABSTRACT/SUMMARY

Liver abscesses due to methicillin-resistant Staphylococcus aureus (MRSA) are rare, particularly in immunocompetent individuals. A previously healthy adolescent girl presented with a three-week history of fever and chills. Imaging revealed a right hepatic lobe abscess, and image-guided percutaneous drainage yielded purulent fluid that cultured MRSA. She had no prior hospitalisation, comorbidities, or known risk factors for MRSA. Empirical antibiotics were escalated to intravenous vancomycin based on culture results, followed by oral linezolid. The patient showed significant clinical improvement, and follow-up imaging demonstrated near-complete resolution. This case highlights the need to consider community-acquired MRSA in non-resolving liver abscesses, even in healthy individuals. Early microbiological evaluation remains key to timely and appropriate treatment.

BACKGROUND

Pyogenic liver abscess is a potentially life-threatening condition that requires prompt diagnosis and management. While most cases are polymicrobial and associated with risk factors such as diabetes, immunosuppression, or biliary disease, liver abscesses due to Staphylococcus aureus—particularly methicillin-resistant strains- are rare. Community-acquired MRSA (CA-MRSA) is typically known for causing skin and soft tissue infections, with deep-seated organ involvement being exceptionally uncommon in healthy individuals.

In this context, a liver abscess caused by CA-MRSA in an immunocompetent patient without any traditional risk factors is a noteworthy finding. This case underscores the importance of considering atypical pathogens in patients with non-resolving liver abscesses and the need for early microbiological identification to guide appropriate therapy.

Data on CA-MRSA prevalence in the United Arab Emirates are scarce. However, reports from neighbouring regions indicate a rising prevalence of CA-MRSA colonization and infections, particularly among young and otherwise healthy populations. This highlights the need for local epidemiological studies to better define the burden and inform regional treatment strategies.

CASE PRESENTATION

A girl in her teens with no significant past medical or family history presented to our emergency department with a three-week history of intermittent fever, chills, and fatigue. Her symptoms had initially started with generalised body aches, nausea, and a transient itchy rash that resolved spontaneously. She had no history of vomiting, diarrhoea, respiratory symptoms, or urinary complaints. She had returned from recent travel to a southern European country and reported owning a pet dog. There was no known contact with unwell individuals or any prior hospital admissions.

On examination, she was alert, febrile, and haemodynamically stable. Abdominal examination revealed a soft, non-distended abdomen. There were no palpable masses or signs of peritonism. Laboratory investigations showed elevated white cell count (13.0×10^9/L), CRP 62 mg/L, while liver enzymes and renal function were within normal limits (Table 1).

Table 1. Laboratory investigations

Test	Result	Reference Range
Haemoglobin (Hb)	9.7 g/dL	11–16 g/dL
Haematocrit (Hct)	29%	31–42%
WBC	13 ×10³/µL	4–11 ×10³/µL
Platelets (Plt)	461 ×10³/µL	150–400 ×10³/µL
PT	17 sec	~11–14 sec
INR	1.2	0.8–1.2
aPTT	42 sec	25–35 sec
Sodium (Na)	135 mmol/L	135–145 mmol/L
Potassium (K)	3.88 mmol/L	3.5–5.0 mmol/L
Chloride (Cl)	97 mmol/L	98–107 mmol/L
Bicarbonate (HCO_3)	25 mmol/L	22–29 mmol/L
Total Bilirubin (TB)	6 µmol/L	0.0–16.9 µmol/L
Direct Bilirubin (DB)	3.08 µmol/L	≤5.1 µmol/L
Alkaline Phosphatase	77 U/L	50–130 U/L
ALT	15 U/L	<45 U/L
AST	19 U/L	<30 U/L
Albumin	30 g/L	32–45 g/L
CRP	62 mg/L	0–5 mg/L
Creatinine (Cr)	54 µmol/L	53–78 µmol/L
Blood Culture	Negative	—
MRSA Swab	Negative	—
Amoebic serology	Negative	
Echinococcosis serology	Negative	

Ultrasound of the abdomen revealed a cystic lesion in the right hepatic lobe. Contrast-enhanced computed tomography confirmed a 5.1×4.3 cm liver abscess [Figure 1]. Image-guided percutaneous drainage (using an 18G needle) was performed, yielding approximately 20 mL of purulent fluid. Microbiological culture of the aspirate revealed heavy growth of methicillin-resistant Staphylococcus aureus. Blood cultures and MRSA

screening swabs were negative. Serology for Entamoeba histolytica and Echinococcus species was also negative.

Based on the susceptibility profile, empirical treatment was escalated to intravenous vancomycin, followed by oral linezolid after clinical improvement. Follow-up imaging after four weeks showed near-complete resolution of the abscess (Figure 2). The patient remained clinically well during outpatient follow-up.

Investigations

Initial laboratory tests revealed an elevated white cell count of 13.0 × 10^9/L (reference: 4–11), platelet count of 461 × 10^9/L (150–400), and a C-reactive protein level of 62 mg/L (0–5), indicating systemic inflammation. The haemoglobin was mildly reduced at 9.7 g/dL (11–16), and the prothrombin time was prolonged at 17 seconds (~11–14), with an international normalised ratio of 1.2. Liver enzymes and renal function tests were within normal limits (Table 1).

Blood cultures and nasal swabs were negative for Staphylococcus aureus, and serological tests for Entamoeba histolytica and Echinococcus species were also negative.

Abdominal ultrasound showed a 4.5 × 4.1 cm cystic lesion in the right hepatic lobe. A contrast-enhanced computed tomography scan confirmed a 5.1 × 4.3 cm peripherally enhancing abscess in the right lobe of the liver (Figure 1).

Percutaneous drainage was performed under ultrasound guidance. Approximately 20 mL of purulent material was aspirated and sent for microbiological analysis. Culture yielded heavy growth of methicillin-resistant Staphylococcus aureus, sensitive to vancomycin, gentamicin, linezolid, rifampicin, and tetracycline, and resistant to ciprofloxacin, erythromycin, and beta-lactams.

WBC: white cell counts; PT: Prothrombin time; INR: International normalized ratio; ALT: Alanine aminotransferase; AST: Aspartate aminotransferase; CRP: C- reactive protein; MRSA: Methicillin resistant staphylococcus aureus.

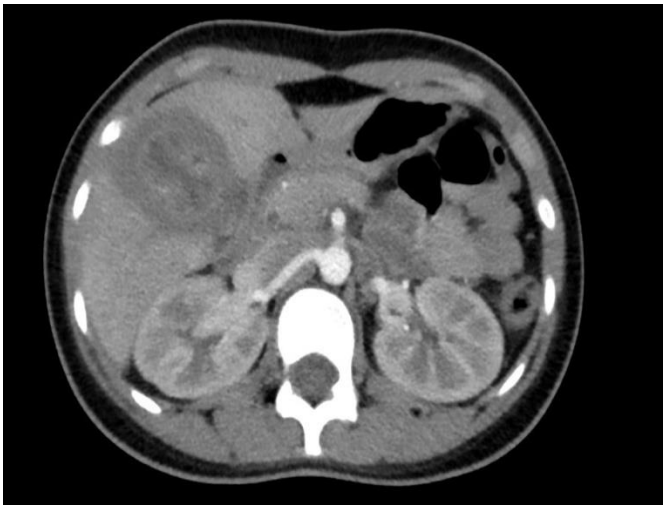

Figure 1: Computed tomography (CT) scan of abdomen showing hepatomegaly. Right lobe of liver (Black arrow) showing inhomogeneous peripherally enhancing cystic lesion presenting organizing abscess.

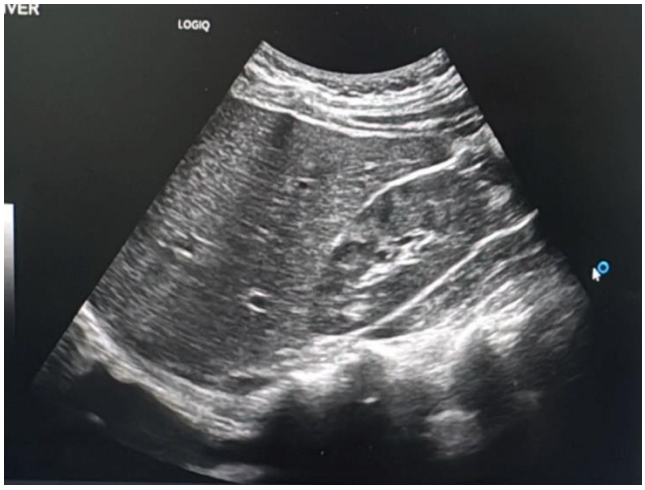

Figure 2: Follow-up abdominal ultrasound demonstrating near-complete resolution of the previously identified liver abscess.

Treatment

Following image-guided percutaneous drainage of the liver abscess, the patient was initially started on empirical intravenous ceftriaxone and metronidazole. Once culture of the aspirated fluid confirmed methicillin-resistant Staphylococcus aureus (MRSA), the antimicrobial regimen was escalated to intravenous vancomycin at a dose of 15 mg/kg every 12 hours. Renal function was monitored closely throughout the course. After 14 days of intravenous therapy and clinical improvement, the patient was transitioned to oral linezolid 600 mg twice daily to complete a total of four weeks of antimicrobial treatment.

The patient did not require surgical intervention or additional drainage procedures. Supportive care included antipyretics, intravenous fluids during initial management, and monitoring of inflammatory markers and liver imaging.

She was not enrolled in any clinical trial, and all treatment strategies used were in accordance with standard clinical practice and established guidelines for MRSA-related deep-seated infections.

Outcome and Follow-up

The patient showed gradual clinical improvement during her hospital stay. After two weeks of intravenous vancomycin, she became afebrile and her abdominal discomfort resolved. She was then discharged on oral linezolid 600 mg twice daily for an additional two weeks.

At follow-up one month after completion of therapy, she remained clinically well, had resumed daily activities and school attendance, and reported no residual symptoms. Repeat abdominal ultrasound showed near-complete resolution of the hepatic abscess with no new lesions (Figure 2).

She continues to be monitored in outpatient care. No signs of recurrence have been noted up to three months post-treatment. Laboratory parameters, including white cell count and C-reactive protein, remained within normal limits. No further antimicrobial therapy or interventions have been required. The patient remains alive and in good health.

This case demonstrates an unusual occurrence of a community-acquired methicillin-resistant Staphylococcus aureus (MRSA) liver abscess in an immunocompetent individual with no identifiable risk factor [1-4]. Persistent fever in adolescents necessitates a broad differential diagnosis that includes infections, autoimmune conditions, and malignancies. However, liver abscesses should be considered, especially in individuals presenting with constitutional symptoms and abdominal discomfor [2,5]. This is the first documented case of a community-acquired MRSA liver abscess in the United Arab Emirates, emphasizing its clinical relevance and highlighting the need for increased awareness among local healthcare professionals.

Liver abscesses are commonly caused by polymicrobial organisms, including gram-negative bacilli and anaerobes [5]. Staphylococcus aureus is a less frequent causative agent, and MRSA-related abscesses are extremely uncommon, typically seen in hospitalized or immunocompromised patient [2,3,5]. In this case, the absence of hospitalization or intra-abdominal pathology supported a diagnosis of community-acquired MRSA infection [1,4]. Unfortunately, molecular typing (e.g., SCCmec characterization) was not performed, which would have provided valuable insights into whether the isolate represented a typical community-acquired MRSA strain. Future regional case series should aim to include molecular epidemiology to clarify circulating clones.

Patients with liver abscesses typically present with right upper quadrant pain (72%), fever (90%), chills (69%), nausea (43%), and vomiting (32%). Laboratory tests often reveal hypoalbuminemia, leukocytosis, and elevated liver enzymes. Diagnostic imaging, such as abdominal ultrasound and computed tomography (CT), is crucial for confirming the diagnosis and assessing the extent of the abscess [7]. Although a comprehensive immunological panel (immunoglobulin quantification, lymphocyte subsets, HIV serology) was not pursued, the absence of past or recurrent infections, normal haematological parameters, and recovery without complications support the conclusion that the patient was immunocompetent.

Approximately half of pyogenic liver abscesses originate from cholangitis. Less common causes include haematogenous spread via the portal vein or hepatic artery, as well as secondary infections from diverticulitis, cholecystitis, or penetrating trauma. When a single organism is isolated, it is essential to investigate potential primary sources, as liver abscesses frequently result from haematogenous dissemination. In community-acquired MRSA infections, skin and soft tissue infections are the most commonly reported sources, often involving the lower limb [8]. Although no obvious skin or soft tissue focus was identified, CA-MRSA commonly colonizes the nares and skin. It is plausible that transient skin colonization or a subclinical lesion served as the portal of entry. This reinforces the importance of considering occult or minor breaches in skin integrity in such cases.

Intravenous vancomycin combined with image-guided percutaneous drainage remains the standard treatment, particularly for MRSA-related abscesses. Inadequate or delayed therapy—usually requiring 2–3 weeks of intravenous antibiotics followed by 2–4 weeks of oral antibiotics—may result in severe complications, including sepsis, peritonitis, or empyema [4].

This case underlines broader public health concerns: CA-MRSA is evolving beyond its classical presentations and may increasingly cause invasive infections in healthy individuals. Data on CA-MRSA prevalence and trends in the United Arab Emirates are limited, but regional reports suggest a rising burden of community-associated strains in both colonization and infection. This underscores the need for robust local surveillance and molecular

typing initiatives to map circulating clones. Clinicians should maintain a high index of suspicion, and policymakers should prioritize surveillance programs to guide empirical therapy and infection control strategies.

Learning Points / Take-Home Messages

- Consider community-acquired methicillin-resistant Staphylococcus aureus (CA-MRSA) as a potential cause of liver abscess even in immunocompetent patients with no known risk factors.
- Persistent fever and abdominal discomfort in adolescents should prompt evaluation for intra-abdominal infections, including liver abscess.
- Early microbiological evaluation of aspirated fluid is critical for identifying atypical pathogens and guiding appropriate antimicrobial therapy.
- Prompt source control through image-guided drainage combined with targeted antibiotics remains the cornerstone of liver abscess management.
- Awareness of evolving MRSA epidemiology is important, as community-acquired strains may increasingly present with deep-seated infections.

Patient's Perspective

When I first got sick, I didn't expect it to last so long. I had fever and pain for weeks, and nobody knew why. It was scary because I had never been to the hospital before. The tests and scans helped figure out what was wrong, and the doctors explained everything clearly. Getting the drain was a little painful, but after that I started to feel much better. I had to stay on strong antibiotics for some time, but I'm glad everything healed. I'm back to school and feeling normal again. I'm very thankful for the care I received and that the doctors didn't give up until they found the cause.

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