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Case report

A fatal case of persistent bacteremia and acute cholecystitis caused by *Staphylococcus aureus*: A case report

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ABSTRACT

Biliary tract infections caused by *Staphylococcus aureus* are rare. Here, we describe a case of fatal acute cholecystitis and persistent bacteremia caused by *S. aureus* in a patient with newly diagnosed diabetes mellitus. *Staphylococcus aureus* can cause bacteremic biliary tract infections, which are associated with higher mortality rates compared to biliary *Klebsiella pneumoniae* bacteremia. Early aggressive treatment and consultations with infectious disease specialists are recommended when biliary *S. aureus* bacteremia is clinically suspected.

Introduction

Acute cholecystitis predominantly occurs as a complication of gallstone disease and typically develops in patients with a history of symptomatic gallstones [1]. *Escherichia coli*, *Pseudomonas aeruginosa*, *Enterococcus* spp., and *Klebsiella* spp. are the most common causative organisms of biliary tract infections [2,3]. On the other hand, Staphylococci are usually associated with skin and soft tissue infections [4]. Although metastatic infections that cause suppurative complications in the bones and joints and intravascular infections are common, *Staphylococcus aureus* infections of the biliary tract are rare [5]. This case report describes a case of fatal acute cholecystitis and persistent bacteremia caused by methicillin-susceptible *S. aureus* (MSSA).

Case

A 58-year-old man with no past medical history presented with general fatigue that persisted for 2 days and was admitted to our hospital. Two days prior to admission, he developed general fatigue. On the day of admission, he visited the local hospital and was transferred to our hospital for a presumed urinary tract infection (UTI).

On physical examination, his blood pressure was 151/66 mmHg, pulse rate was 111 beats per minute, body temperature was 36.8 °C, respiratory rate was 20 breaths per minute, and oxygen saturation was 96% in room air. The results of physical examination were unremarkable, with no indication of Murphy sign; however, costovertebral angle tenderness in the patient's right back was reported.

Initial laboratory tests revealed a white blood cell count of 11900/μL with 95% neutrophils; haemoglobin level of 14.3 mg/dL; and platelet count of 120,000/μL.

Evaluation of serum chemistry revealed the following: blood urea nitrogen, 131 mg/dL; creatinine, 3.1 mg/dL; sodium, 124 mEq/L; potassium, 3.7 mEq/L; chloride, 83 mEq/L; albumin, 2.1 g/dL; total protein 5.4 g/dL; aspartate aminotransferase, 98 IU/L; alanine aminotransferase, 45 IU/L; lactate dehydrogenase, 717 IU/L; alkaline phosphatase, 474 U/L; total bilirubin, 1.3 mg/dL; direct bilirubin, 1.0 mg/dL; glucose, 460 mg/dL; C-reactive protein, 35.6 mg/dL; HbA1c, 10.6%; prothrombin time, 13.4 s; activated partial thromboplastin time, 31.7 s; and D-dimer, 10.7 ng/mL. Urinalysis revealed 3 + glucose and 1 + ketone. Chest radiography revealed no signs of pneumonia. Computed tomography (CT) scan of the abdomen revealed swelling of the right kidney. Urinalysis revealed a leukocyturia level of 30–49 per high-power field microscopy, and gram staining of the urine sample demonstrated gram-positive cocci with multiple neutrophils. Accordingly, the patient was diagnosed with a UTI and newly diagnosed diabetes mellitus in the emergency room, and treatment with ampicillin/sulbactam (1.5 g every 8 h) was initiated.

On day 2, urgent upper endoscopy was performed due to

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hematemesis. The patient was diagnosed with duodenal ulcer and necrotizing esophagitis.

On day 3, evaluation of the blood and urine cultures collected at the time of admission revealed the presence of MSSA. The bacterial species was identified using the DPS MIC192/ID system (Eiken Chemical, Tokyo, Japan). After repeated blood cultures, the patient's treatment regimen was switched to cefazolin (2 g every 8 h). Transthoracic echocardiography and transesophageal echocardiography were negative for vegetation. On day 4, the patient developed right upper quadrant pain with elevated liver function test findings (aspartate aminotransferase, 142 IU/L; alanine aminotransferase, 127 IU/L; lactate dehydrogenase, 701 IU/L; alkaline phosphatase, 837 IU/L; total bilirubin, 1.6 mg/dL; and direct bilirubin, 1.2 mg/dL). Abdominal ultrasonography revealed gallbladder wall thickening and sonographic Murphy sign. Abdominal CT revealed gallbladder dilatation (Fig. 1).

On day 5, percutaneous transhepatic gallbladder drainage (PTGBD) was performed based on the acute cholecystitis diagnosis due to worsening right upper quadrant pain. Gram staining of the bile sample revealed clustered gram-positive cocci with neutrophils. Blood and bile cultures from day 3 also revealed MSSA. The patient gradually improved post-PTGBD; however, on day 8, he developed cardiac arrest due to hematemesis, black stools, and decreased hemoglobin level. Urgent endoscopy was performed, and the patient was diagnosed with active hemorrhagic duodenal ulcer. The patient died on the tenth day of admission, following discontinuation of further aggressive treatment as per the request of the patient's family.

Discussion

This case report describes a case of fatal acute cholecystitis and persistent bacteremia caused by MSSA. Although the patient was diagnosed with UTI in the emergency room, we believe that the UTI was a secondary effect of bacteremia caused by MSSA [6]. *Staphylococcus aureus* infections are quite common, such as bacteremia, endocarditis, osteomyelitis, septic arthritis, skin and soft tissue infections, and pneumonia. However, *S. aureus* biliary tract infections are rare, and only 0.8–5.6% of *S. aureus* isolated from bile and cholecystectomy specimens [7,8]. Similar to earlier clinical cases, although the exact metastatic focus or the source of infection remained unclear, our patient was diagnosed with concomitant bacteremia [9–12]. In patients with *S. aureus* bacteremia (SAB) of unclear etiology, the possibility that the gallbladder may be the source of infection should always be considered.

In general, mortality rates associated with SAB are high. The 30-day all-cause mortality rate for SAB is 20–30% and has not changed since the 1990 s [13]. Biliary SAB is associated with high mortality [5]; the 12-week mortality rate in the biliary SAB group (59.5%) was higher than the mortality rate in the *Klebsiella pneumoniae* bacteremia group (13.5%) [5].

Current guidelines emphasize the need for immediate intervention and detailed diagnostic evaluation in patients diagnosed with SAB [4]. Adherence to evidence-based quality-of-care indicators during the treatment of patients with SAB improves the outcomes of guideline-recommended treatment, which includes source control, echocardiography, appropriate antimicrobial therapy, and follow-up cultures [14–16]. The association between consultations with an infectious disease specialist (IDS) and improved outcomes for patients with SAB has been well established in earlier studies [14–17]. Owing to the high mortality rates associated with biliary SAB, consultations with an IDS should be recommended in suspected cases of biliary SAB.

In conclusion, we report a case of fatal acute cholecystitis and persistent bacteremia caused by MSSA. Physicians should be aware that hematogenous seeding of infectious organisms, including *S. aureus*, can cause acute cholecystitis. Despite the rarity of biliary SAB, it is associated with high mortality rates, thus emphasizing the need for early aggressive treatment when biliary SAB is clinically suspected.

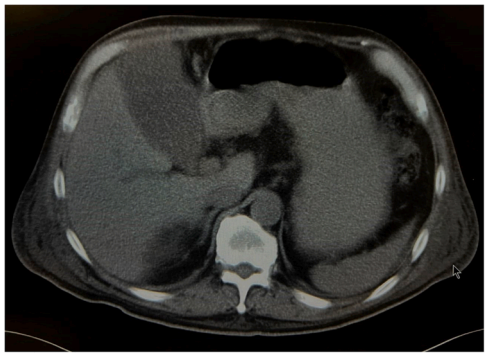

Fig. 1. Computed tomography scan of the abdomen showing thickening of the gallbladder wall.

Ethical approval

The study was approved by the Institutional Review Board of Itabashi Chuo Medical Center.

CRediT authorship contribution statement

Yoshiro Hadano: Conceptualization, Data curation, Investigation, Methodology, Project administration, Writing - original draft. **Toshiyuki Hijikata:** Conceptualization, Investigation, Supervision, Writing - review & editing.

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Ethics statement

This report is in accordance with the principles of the Declaration of Helsinki (2013). The patient's family provided consent for the case report to be published.

Conflict of Interest

The authors declare no conflicts of interest.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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