Staphylococcus epidermidis catheter-related bloodstream infection leading to acute acalculous cholecystitis and septic shock

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Introduction

Catheter-related bloodstream infections are one of the most serious complications of central venous catheterisation, and the most common cause of nosocomial bacteraemia. The organisms responsible usually come from the skin flora at the site of insertion, with coagulase-negative staphylococci being an expected but relatively rare cause. Diagnosis can be established with a positive blood culture from a peripheral vein, a simultaneous blood culture from the catheter that becomes positive at least 2 hours before the peripheral, clinical manifestations of infection, and no apparent source for the bacteraemia other

Case report

A 68-year-old man with intermittent claudication presented to the emergency ward complaining of abdominal pain. Upon admission he was haemodynamically stable and afebrile. A painful pulsating mass was noted in the mesogastrium. Blood tests showed no abnormalities. A contrast-enhanced thoracoabdominal computed tomography scan revealed an uncomplicated 11 cm infrarenal abdominal aortic aneurysm, and atheromatous narrowing of the coeliac trunk and superior mesenteric artery. He was diagnosed with chronic mesenteric ischaemia and admitted for revascularisation. A peripherally inserted central catheter was placed to administer parenteral nutrition. Femoral angiography was performed 1 week later, implanting stents in the coeliac trunk and superior mesenteric artery.

The following day, the patient developed abdominal pain and bloating, which was attributed to after-effects of the surgery. During a febrile peak of 38.3°C, differential blood cultures were obtained from the peripherally-inserted central catheter and peripheral vein. The patient further deteriorated, and the next day he was drowsy, hypotensive (65/43 mmHg), tachycardic, oligoanuric, with acute respiratory failure (oxygen saturation 80% on ambient air) and abdominal rigidity on examination. Blood tests showed (normal values in brackets): leukocytes 11 100/µl (4000–10 000/µl), with neutrophils 94% (<75%), platelets 126 000/µl (>140 000/µl), creatinine 4 mg/dl (0.5–1.1 mg/dl), total bilirubin 1 mg/dl (1–1.8 mg/dl), C-reactive protein 362 mg/litre (<5 mg/litre), procalcitonin 41.8 ng/ml (<0.5 ng/ml), pH 7.42 (7.35–7.45), venous partial pressure of CO_2 19 mmHg (30–50 mmHg), venous bicarbonate 12 mmol/litre (22–28 mmol/litre) and lactate 4.7 mmol/litre (<2 mmol/litre).

He was diagnosed with septic shock (SOFA score 12) of abdominal origin with multi-organ failure (haemodynamic, renal, respiratory). Supportive measures (including vasoactive amines) and empirical antibiotic therapy with piperacillin-tazobactam were initiated. An abdominal computed tomography scan showed the stability of the aortic aneurysm, patency of the revascularised visceral trunks, and advanced acute cholecystitis (Figure 1) with no evidence of perforation.

The patient underwent an emergency open cholecystectomy, revealing a gangrenous gallbladder with biliohaemorrhagic content. On the same day, blood cultures were positive for oxacillin-susceptible *Staphylococcus epidermidis*, and the growth time indicated a catheter-related infection. The peripherally-inserted central catheter was removed and cloxacillin (2 g every 4 hours) was added to the treatment. Subsequently, growth of the same strain of *S. epidermidis* (same antibiotic susceptibility) was confirmed in an intraoperative bile culture, so antibiotic therapy was de-escalated to cefazolin (2 g every 8 hours) as monotherapy. A transthoracic echocardiogram ruled out endocarditis. Histopathological study of the surgical specimen confirmed acute necrohaemorrhagic acalculous cholecystitis, with Gram-positive cocci found in some areas of ischaemia. The patient completed 2 weeks of treatment and made a complete recovery.

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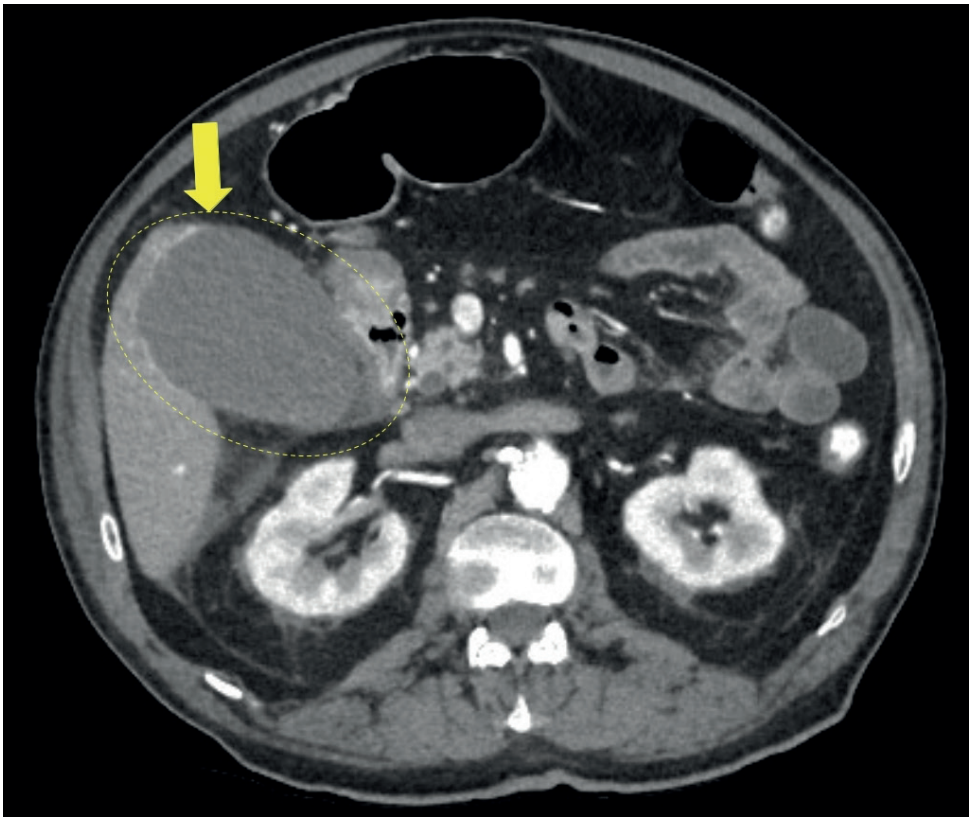

Figure 1. Axial section from the contrast-enhanced abdominal computed tomography scan, showing a distended gallbladder with wall enhancement (arrow) suggestive of advanced acute cholecystitis

than the catheter. On the other hand, acalculous cholecystitis is an uncommon acute necroinflammatory disease of the gallbladder associated with high morbidity and mortality. Staphylococcal cholecystitis is a very rare condition, with very few cases reported so far. This article presents the case of a patient who suffered concurrently from all of these conditions.

Discussion

Acalculous cholecystitis is an acute necroinflammatory disease of the gallbladder, accounting for approximately 10% of all cases of acute cholecystitis. It is usually seen in hospitalised and critically ill patients, and is associated with high morbidity and mortality rates (Lam et al, 2021). Multiple risk factors have been described, including prolonged fasting and total parenteral nutrition (Roslyn et al, 1983). Secondary infection with enteric pathogens is common once it is established.

This is the first reported case of acute cholecystitis presumably caused by *S. epidermidis* arising from haematogenous spread, to the best of the author's knowledge. Martínez-Lage et al (2008) reported a 3-year-old boy with *S. epidermidis* meningitis who developed acute cholecystitis together with a subphrenic abscess, adjacent to an infected ventriculoperitoneal shunt. Twenty-two other cases of staphylococcal cholecystitis have been described, predominantly caused by *S. aureus* (Segireddy et al, 2010; Kim et al, 2011; Martin et al, 2011; Tascini et al, 2011; Nepal et al, 2012; Elikowski et al, 2017), but with one being caused by *S. cohnii* (Álvarez Posadilla et al, 2006). Most cases presented with bacteraemia (77%), half of them had cholelithiasis, and the overall mortality was 14%.

In this case, the source of the bacteraemia was a catheter-related bloodstream infection arising from the peripherally-inserted central catheter, based on the results of the differential quantitative blood cultures. The patient probably developed acalculous cholecystitis during the peri-angiography period, facilitated by prolonged total parenteral nutrition, and the bacteraemia promoted infection of the gallbladder. The intraoperative bile culture showing the same strain of *S. epidermidis*, and the presence of Gram-positive cocci in ischaemic areas of

Learning points

- Acalculous cholecystitis is an uncommon acute necroinflammatory disease of the gallbladder associated with high morbidity and mortality.
- Several risk factors have been associated with the occurrence of acalculous cholecystitis, including prolonged fasting and total parenteral nutrition.
- Staphylococcal cholecystitis is a very rare condition. Only 24 cases have been reported so far, including this case.
- Most reported cases were caused by *Staphylococcus aureus* and arose from haematogenous spread – only half presented as acalculous cholecystitis.
- To the author's knowledge, this is the first reported case of acute cholecystitis presumably caused by *S. epidermidis* from haematogenous dissemination, and the second overall.

the gallbladder wall, supports its presumed role in the onset of the acute necrohaemorrhagic cholecystitis, although this is not definite given the lack of available data.

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