

# Splenic Abscess Caused by *Streptococcus gallolyticus* subsp. *pasteurianus* as Presentation of a Pancreatic Cancer

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**Splenic abscesses caused by *Streptococcus bovis* are rarely reported in the literature and are mainly seen in patients with endocarditis and associated colonic neoplasia/carcinoma. We report the first case of splenic abscess caused by *Streptococcus gallolyticus* subsp. *pasteurianus* (*Streptococcus bovis* biotype II/2) as presentation of a pancreatic cancer.**

## CASE REPORT

A 55-year-old man was referred to the Department of Infection and Critical Care Medicine, Beijing Friendship Hospital, Capital University of Medical Sciences (Beijing, China), because of persistent fever over 40°C for 9 days with shaking and chills. He also complained of general fatigue and loss of appetite but had no abdominal pain, vomiting, weight loss, or other symptoms. His previous medical history was unremarkable. On physical examination, fever was present (39.3°C), lung fields were clear, heart sounds were regular without murmur, and the abdomen was soft, nondistended, and with no palpable mass.

Initial laboratory studies showed a white blood cell count of  $16.7 \times 10^9$ /liter with 83.6% neutrophils. A stool occult blood test was negative. Inflammatory tests showed the following results: a C-reactive protein level of  $>160$  mg/dl (normal, 0.0 to 0.8 mg/dl) and a procalcitonin (PCT) level of 2.32 ng/ml (reference range, 0 to 0.05 ng/ml). Tumor markers CA125 and CA19-9 increased greatly: CA19-9 to  $>1,200$  U/ml (reference range, 0 to 37 U/ml) and CA125 to 247.9 U/ml (reference range, 0 to 37 U/ml). However, the carcinoembryonic antigen level was normal. The results of the pancreatic amylase test and creatinine, glucose, and liver function tests were all within normal limits. Blood cultures were collected.

A chest radiograph was unremarkable; however, a chest computed tomography (CT) scan showed lobar consolidation in the left lower lobe with associated pleural effusion. An abdominal ultrasound exam demonstrated a hypoechoic area in the spleen with an unclear margin, suggestive of a splenic abscess. An enhanced abdominal CT further revealed a nonenhancing hypodense lesion in the tail of the pancreas with invasion into the spleen and multiple hypodense lesions in the liver, along with the splenic lesion (Fig. 1a and b). The splenic artery was slender without obvious filling of the contrast agent. These findings were also demonstrated on magnetic resonance imaging studies. Together, the imaging studies, constitutional presentation, and laboratory test results suggested a working diagnosis of an occult pancreatic cancer and a splenic abscess.

Empirical antibiotic therapy with intravenous piperacillin-tazobactam and azithromycin was started. However, the patient's fever persisted, up to 40.5°C, which required a switch of antimicrobials to imipenem-cilastatin and vancomycin in order to broaden the coverage. On the 4th hospitalization day, an endoscopic ultrasound (EUS)-guided percutaneous drainage of the splenic abscess was performed, which aspirated 50 ml odorless

pus, leading to a decrease of the patient's temperature. The aspirate was stained and cultured. Numerous white blood cells were found, and the Gram-positive coccus was isolated and identified as *Streptococcus gallolyticus* by Vitek 2 compact GP systems (bioMérieux, France). On the 5th hospitalization day, the isolate from initial blood culture was also identified as *S. gallolyticus*. Subsequently on the 7th day, the patient underwent EUS-guided percutaneous drainage again, 100 ml of pus was obtained, and the culture was the same *S. gallolyticus* isolate. The isolate was tested by a microdilution method according to the published CLSI standard (1) and proved sensitive to vancomycin and cefotaxime and resistant to erythromycin, clindamycin, and levofloxacin. Treatment with intravenous (i.v.) vancomycin was continued. The isolate was further identified to the subspecies level by partial sequencing of 16S rRNA gene (Institute for Biological Product Control, National Institutes for Food and Drug Control, Beijing, China). Bacterial genomic DNA was extracted with the DNeasy blood and tissue kit (Qiagen). The 16S rRNA gene was amplified by PCR with the universal primers 27F (5'-AGAGTTTGATCMTGGCTCAG-3') and 1492R (5'-TACGGYTACCTTGTTACGACTT-3'). The PCR amplification program was followed by 95°C (30 s), 55°C (30 s), and 72°C (90 s) for 30 cycles and a final extension step at 72°C (10 min). The products were purified and submitted for nucleotide sequencing (Shanghai Songan Biological Engineering Technology & Services Co., Ltd., Shanghai, China). The 16S rRNA gene sequences were compared by using the BLASTN program at the U.S. National Center for Biotechnology Information website (<http://www.ncbi.nlm.nih.gov/BLAST/>) and showed 100% (1,414/1,414 bp) homology with *S. gallolyticus* subsp. *pasteurianus* (GenBank accession no. EU163502).

Considering the association between *Streptococcus bovis*/*S. gallolyticus* bacteremia and colonic carcinoma, the patient underwent colonoscopy, but no significant lesions were found. The surgical service was consulted, but eventually the patient refused an operation for the pancreatic cancer. After treatment with antibiotics and EUS-guided PCD, the culture of drainage turned nega-

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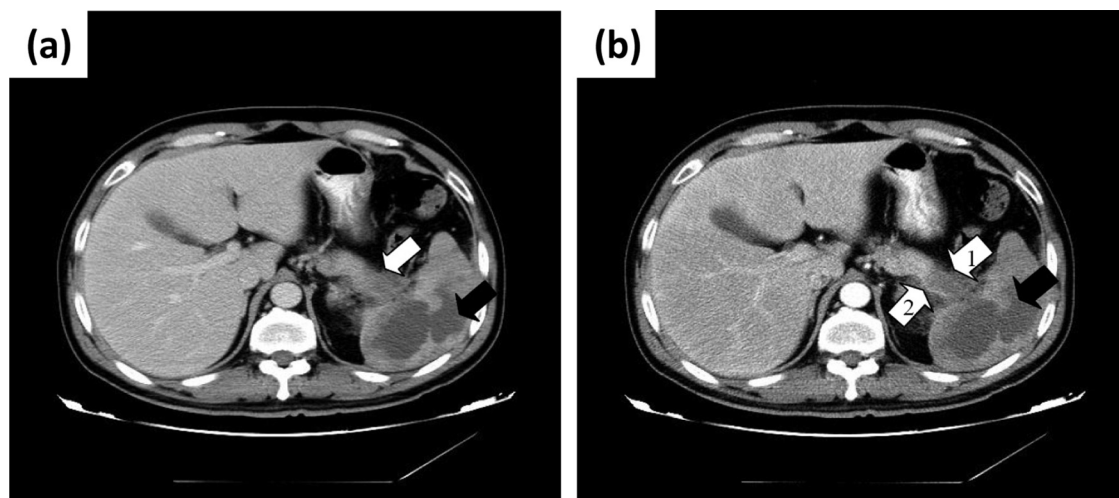
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**FIG 1** (a) CT scan (portal phase) image of a hypodense area that invaded hilum of spleen, in the tail of pancreas (white arrow), and an irregular hypodense area with an unclear margin in the spleen (black arrow). (b) CT scan (arterial phase) image of nonenhancing hypodense area that invaded hilum of spleen, in the tail of pancreas (white arrow 1), and an irregular nonenhancing hypodense area in the spleen (black arrow). The splenic artery is slender (white arrow 2).

tive, and the patient was discharged 3 weeks later in stable condition.

The patient was followed up after discharge. He was advised to go to the Beijing Cancer Hospital, where the same diagnosis of pancreatic tail cancer was made. However, the patient also refused an operation or chemotherapy. His condition deteriorated in the next several months, including development of abdominal symptoms, ascites, and other symptoms. He died 6 months later.

Splenic abscess is a rare clinical entity, occurring in 0.14% to 0.7% of autopsy studies (2). It generally occurs in patients with neoplasia, immunodeficiency, trauma, metastatic infection, splenic infarct, or diabetes (3). Splenic abscess is often misdiagnosed, because its signs and symptoms are nonspecific. Sarr and Zuidema suggested the triad of fever, left upper quadrant pain, and a tender mass for diagnosis of splenic abscess (4). However, fever was the only symptom observed in our patient.

The pathogenesis of splenic abscess is multifactorial, including metastatic infection, contiguous infection, noninfectious splenic embolism with ischemia, and secondary infection, trauma, and immunodeficiency (5). Additionally, the metastatic infection of the spleen is often caused by a different primary site of infection, especially endocarditis. In our case, the patient's echocardiography was normal, which essentially ruled out endocarditis as the source of the splenic abscess. Instead, the occult pancreatic cancer was the probable cause of the large abscess, which caused persistent fever with positive blood culture.

A variety of microorganisms have been isolated from splenic abscesses (6, 7). The frequently isolated aerobic and facultative isolates were *Escherichia coli*, *Proteus mirabilis*, *S. bovis*, *Klebsiella pneumoniae*, and *Staphylococcus aureus*. The isolated anaerobes were *Peptostreptococcus* spp., *Bacteroides* spp., *Fusobacterium* spp., and *Clostridium* spp. (6, 7). The organisms isolated often reflect the underlying pathogenesis: i.e., *S. aureus* and *S. bovis* were associated with endocarditis, *K. pneumoniae* with respiratory infection or liver abscess, *E. coli* with urinary tract and abdominal infection,

and *Bacteroides* spp. and *Clostridium* spp. with abdominal infection (6). Cases of splenic abscess caused by *S. bovis* are rare and usually due to septic emboli from endocarditis in patients with colonic cancer (8, 9). To our knowledge, our case is the first report of a splenic abscess in association of pancreatic cancer along with subspecies identification.

*S. gallolyticus* subsp. *pasteurianus* belongs to the group D streptococci and was previously recognized as *S. bovis* biotype II/2. *S. bovis* is found as part of the human gastrointestinal microbiota in 5 to 16% of individuals (10). Using the scheme proposed by Schlegel et al. (11), on the basis of DNA studies, there are two *Streptococcus* species of principal interest: *S. gallolyticus*, with the subspecies *gallolyticus* (formerly biotype I), *pasteurianus* (formerly biotype II/2), and *macedonicus*; and *S. infantarius* (formerly biotype II/1), with the subspecies *coli* and *infantarius*. Each biotype has somewhat different pathogenicity. *S. gallolyticus* subsp. *gallolyticus* (biotype I) has been associated frequently with underlying colorectal cancer (12). *S. infantarius* (biotype II/1) could be associated with noncolonic cancers (13). *S. gallolyticus* subsp. *pasteurianus* (biotype II/2) has been reported recently to cause neonatal and adult meningitis (14–16) and bacteremia and peritonitis (17, 18) but not solid organ infections.

The association between *S. bovis* bacteremia and pancreatic carcinoma was first reported in 1980 (19) and has been reported in only a few case reports to date (13, 19–22), but molecular genetic characterization of strains was not described in the studies. One of them described the association with *S. infantarius* (13), but there is no reported case associated with *S. pasteurianus*. Our case of *S. gallolyticus* subsp. *pasteurianus* bacteremia with splenic abscess and underlying pancreatic cancer reminds clinicians that malignancy might be a potential feature to search for.

Splenic abscess as a complication of pancreatic cancer has been reported in only a few cases to date (23–27). This may be due to the location of the tumor in the pancreas. As we all know, pancreatic carcinoma occurs most commonly in the head, and as such, usually presents with obstructive jaundice. Conversely, the least common location for pancreatic carcinoma, as seen in our patient, is in

the tail. These cancers tend to present later and are larger at presentation than pancreatic head tumors, with signs of advanced disease, such as contiguous organ extension, vascular invasion, and distant metastases (24), and splenic involvement can include infarction, abscess, intrasplenic pseudocysts, and hemorrhage (28).

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