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Correspondence

Splenic abscess complicating thoracic empyema: A rare complication of salmonellosis

Dear Editor,

We read with great interest the article by Liu et al. describing splenic abscess at a tertiary medical center in northern Taiwan published at J Microbiol Immunolo Infect.1 Non-typhoid salmonellosis mainly occurs in immunocompromised individuals and occasionally causes extra-gastrointestinal infections.1-3 The concomitance of splenic abscess and thoracic empyema is rare.4-5 We report a case of splenic abscess caused by salmonella group D 1, which invaded the diaphragm and was complicated by thoracic empyema. There was also biofilm formation refractory to antibiotic therapy. Finally, the patient was successfully treated through surgical debridement, decortication of the pleural cavity, splenectomy, and antibiotic therapy.

A 78-year-old man with a medical history of chronic hepatitis C virus infection related to liver cirrhosis as well as hepatocellular carcinoma was receiving radiofrequency ablation (RFA) and transarterial chemoembolization (TACE). He was transferred to our hospital with acute onset of left pleuritic chest pain and dyspnea. On admission, he had a temperature of 38.9 °C with high fever and chills, blood pressure of 159/88 mmHg, pulse rate of 105 bpm, respiratory rate of 28/min, and oxygen saturation of 91% under room air conditions. Respiratory examination revealed dullness on percussion and decreased breathing sounds in the left lung field. Pitting edema was noted at the bilateral legs and ankles. The laboratory data revealed leukocytosis with a white blood cell count (WBC) of 20100/μL and an elevated CRP concentration of 10.5 mg/dL. A chest X-ray disclosed left massive pleural effusion (Fig. 1A). A thoracentesis was subsequently performed and pleural fluid analysis revealed a high WBC count of 5178/μL, total protein of 5.2 g/dL, and lactate dehydrogenase concentration of 208 U/L. These values are consistent with exudative leukocytosis with predominant neutrophils. Three days later, blood and pleural fluid culture grew non-typhoid *Salmonella* group D 1. The isolate was analyzed by matrix-assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF) using Bruker Biotyper (Bruker Daltonik GmbH, Bremen, Germany) and identified as *Salmonella* group D (score value, 2.24). We used the BD Company Salmonella Antisera panel for identification of salmonella species, including Salmonella O antisera Poly A-I and Vi, and Salmonella O antisera A、B、C1、C2、D1、D2 etc. The pathogen was identified as Salmonella group D1. The antimicrobial susceptibilities test using the VITEK®2 automatic susceptibility system (bioMérieux, Marcy-l'Étoile, France) revealed that minimal inhibition concentration (MIC) of Ampicillin: $\leq$ 4 mg/L, Ceftriaxone: $\leq$ 1 mg/L, Cefotaxime: $\leq$ 1 mg/L, Ciprofloxacin: $\leq$ 0.5 mg/L, Levofloxacin: $\leq$ 1 mg/L, Imipenem: $\leq$ 0.25 mg/L, Meropenem: $\leq$ 0.25 mg/L, TMP/SXT: $\leq$ 0.5/9.5 mg/L respectively. A chest tube insertion was performed immediately. A computed tomography (CT) scan accidently demonstrated a 3.5 $\times$ 5.3 cm loculated fluid with wall thickening in the upper pole of the spleen interpreted as a splenic abscess (Fig. 1B). CT-guided percutaneous drainage for the splenic abscess was performed, and the pus grew the same pathogen as pleural effusion.

Antibiotic combination therapy with ciprofloxacin 400 mg intravenous drip (ivd) q12 h and cefotaxime 2 g ivd q6h were administered according to the susceptibility test. Nevertheless, a series of chest radiological images revealed persistent left thoracic empyema. The patient eventually underwent pleural decortication and debridement through left single port video-assisted thoracic surgery (VATS) one month after admission, and exploratory thoracotomy and splenectomy were performed the following week. Severe

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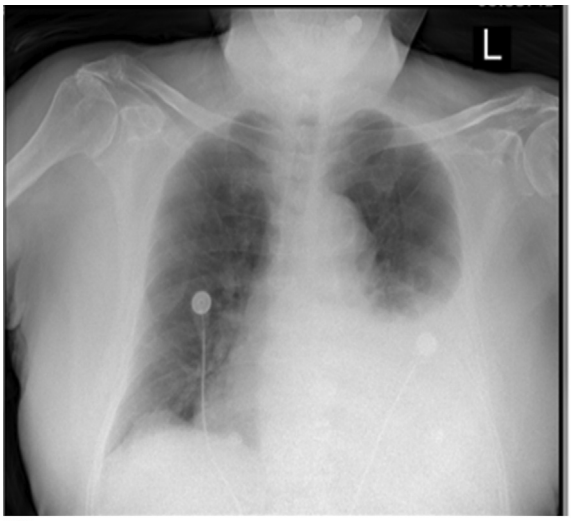
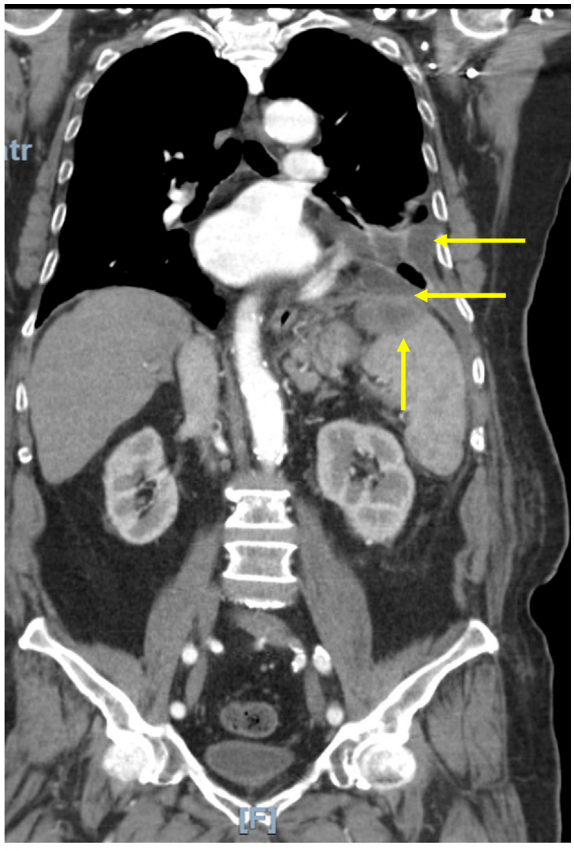


(A)

Figure 1(A). The chest X-ray revealed extensive pleural effusion of the left lung.



(B)

Figure 1(B). The computed tomography scan of the chest and abdomen shows splenic abscess invading the diaphragm and complicated by thoracic empyema.

adhesion was observed between the spleen and left diaphragm without perforation. The patient received a complete course of antibiotic combination therapy for 8 weeks and was discharged in a relatively stable condition.

The genus Salmonellae consists of rod-shaped, gram-negative, and flagellated facultative anaerobes belonging to the family Enterobacteriaceae.[1–5] Microbial products from the gut microbiota influence different biological processes, including metabolism and aging, observed from lower to higher organisms, and specific bacterial products are associated with human disorders such as obesity, diabetes, liver diseases, and autoimmune diseases.[1,3,5] This case can be used to illustrate our knowledge of Salmonella pathogenesis related to diaphragm penetration, biofilm formation, and host response.[1–5] Biofilm formation is a process whereby microorganisms irreversibly attach to and grow on a surface and produce extracellular polymers that facilitate attachment and matrix formation, resulting in an alteration in the phenotype of the organisms with respect to growth rate and gene transcription.[2,3,6] The extra-intestinal infections included mycotic aneurysm, pneumonia, empyema, spinal osteomyelitis, liver abscess, splenic abscess, and septic arthritis.[3–5] Metastatic focal infections constitute 7—12% of all non-typhoid Salmonella infections[4,5] that rarely have different site of coinfections including concurrent empyema and splenic abscess.[2,4,5] A literature review of 38 reported cases of non-typhoid *Salmonella* empyema[2–5] showed only 6 documented cases of concurrent splenic abscess and thoracic empyema within the past 40 years. Percutaneous image-guided drainage for a single splenic abscess and splenectomy is safe and effective.[1,4,5] We treated *Salmonella* splenic abscess and empyema by percutaneous drainage with antibiotics initially. However, the splenic abscess did not resolve completely, and the empyema persisted after 5 weeks of therapy. Due to the biofilm formation and penetration of the pleural cavity complicated by thoracic empyema,[6] we performed exploratory thoracotomy plus decortication and splenectomy to remove the infectious source.

In conclusion, *Salmonella* infections rarely cause concurrent splenic abscess and thoracic empyema, but they can lead to biofilm formation and become refractory to antibiotic therapy. The diaphragm can be penetrated and complicated by thoracic empyema in immunocompromised patients. Surgical intervention should be performed as soon as possible if conservative drainage fails.

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