

Right costophrenic angle abscess due to *Salmonella* Dublin infection in combination with type 2 diabetes mellitus

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Abstract

The main manifestations of type 2 diabetes mellitus are excessive drinking, polyphagia, polyuria and wasting or weight loss in a short period of time, but it is rare to have persistent fever of unknown origin as the main manifestation. This case report describes a 68-year-old male patient with type 2 diabetes mellitus presenting with unexplained fever with persistent exacerbation and a cystic lesion in the right costophrenic horn on abdominal computed tomography (CT). A cytoculture examination of the puncture fluid suggested that the infection was due to *Salmonella* Dublin. The patient was treated with drainage of the abscess in the right costophrenic angle area, which then healed successfully. These findings suggest that *Salmonella* Dublin infection should be considered when a patient with type 2 diabetes mellitus presents with an unexplained persistent fever. At the same time, CT-guided abscess puncture can be performed to improve the patient's symptoms, aid diagnosis and improve the quality of life.

Keywords

Fever, *Salmonella* Dublin, abscess

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Introduction

Diabetes mellitus is one of the metabolic diseases of common concern.¹ The mechanism by which diabetes mellitus arises is either an absolute deficiency of insulin due to destruction of pancreatic beta cells or a relative deficiency of insulin due to resistance of tissue cells to the action of insulin.¹ The inflammatory response often seen in patients with diabetes mellitus is the result of a combination of an immune response and inflammatory mediators.¹ *Salmonella* Dublin can infect humans and animals, with cattle as its natural host, and humans are infected by ingesting unpasteurized milk products.² If a fungal aneurysm caused by *Salmonella* infection develops as a complication of diabetes mellitus, the patient will develop fever and there is a high mortality rate.³ However, coinfection with *Salmonella* Dublin is very rare in patients with diabetes mellitus and has not been previously reported, although there have been cases of diabetes mellitus combined with subphrenic abscesses.^{4,5}

This current case report describes a 68-year-old male patient characterized by persistent fever. A computed tomography (CT)-guided puncture of the right costophrenic horn abscess was performed and the puncture fluid was sent for cell culture examination. This patient was diagnosed with diabetes mellitus combined with *Salmonella* Dublin infection resulting in an abscess in the right costophrenic angle. The patient's clinical symptoms returned to normal after drainage of the abscess in the right costophrenic angle area. At 3 months of follow-up after discharge, the patient's quality of life had returned to normal.

Case report

In March 2021, a 68-year-old male patient was admitted to The Fourth Hospital of Hebei Medical University, Shijiazhuang,

Hebei Province, China as an outpatient with 'type 2 diabetes mellitus' due to 10 years of elevated blood glucose and numbness and coldness in both lower extremities with intermittent claudication for more than 1 month. Physical examination showed no abnormalities. The patient was admitted with a lower extremity vascular ultrasound examination. Examination of the ultrasound findings suggested the possibility that the patient had multiple plaque formations due to atherosclerosis. In addition, routine blood tests were performed on the patient. The patient had an increased white blood cell count with a value of $11.63 \times 10^9/l$. The patient had an elevated neutrophil count with a value of $9.136 \times 10^9/l$. The patient had an enhanced neutrophil percentage with a value of 78.60%. The rest of the routine blood tests showed normal results.

During admission, the patient developed an unexplained fever and his symptoms continued to worsen. Due to the patient's symptoms mentioned above, routine blood tests were performed again. The results of the examination showed that the patient had a white blood cell count of $17.86 \times 10^9/l$, a neutrophil count of $14.32 \times 10^9/l$ and a neutrophil percentage of 80.20%. All routine blood test values were within normal limits except for the white blood cell count, neutrophil count and neutrophil percentage, which were higher than the previous test values. According to the patient's severe and persistently worsening fever symptoms, the patient was considered to have a serious infection, but the patient's foci of infection were limited, and it was recommended to change the antibiotic anti-infection treatment. Cefoperazone sodium sulbactam was administered (2.25 g cefoperazone sodium sulbactam dissolved in 250 ml of saline, administered intravenously three times a day for 3 days), but the patient's febrile symptoms were not effectively

relieved and the treatment was not effective. The patient then underwent an abdominal CT examination. Based on this examination, the patient was diagnosed with a cystic solid lesion in the right costophrenic angle (Figure 1). To further clarify the



Figure 1. Pretreatment computed tomography examination of a 68-year-old male patient admitted as an outpatient with type 2 diabetes mellitus and numbness and coldness in both lower extremities with intermittent claudication for more than 1 month showed a cystic solid lesion in the right costophrenic angle (hand).

cause of the fever, CT-guided puncture of the right costophrenic angle abscess was performed in stages; and 90 ml of purulent fluid and 100 ml of bloody fluid were withdrawn (Figure 2), while negative pressure continuous drainage was applied. To clarify the nature of the lesion, puncture fluid was sent for cytoculture examination. The bacterial culture results showed *Salmonella* Dublin infection (Table 1). Following the CT-guided puncture of the right costophrenic angle abscess, the patient developed hypoproteinaemia, so they were administered 5g of hydrolyzed protein orally once daily for 1 day to improve their nutritional status. Then they were administered an additional 30g of hydrolyzed protein orally once daily for 1 day. Following abscess drainage, administration of 2g ceftriaxone sodium dissolved in 100 ml saline injected intravenously once a day for 2 days and hydrolyzed protein supplementation, the patient's body temperature normalized at 2 days. At the same time, the patient's routine blood tests were reviewed, which showed that the values had returned to normal. A repeat CT scan of the upper

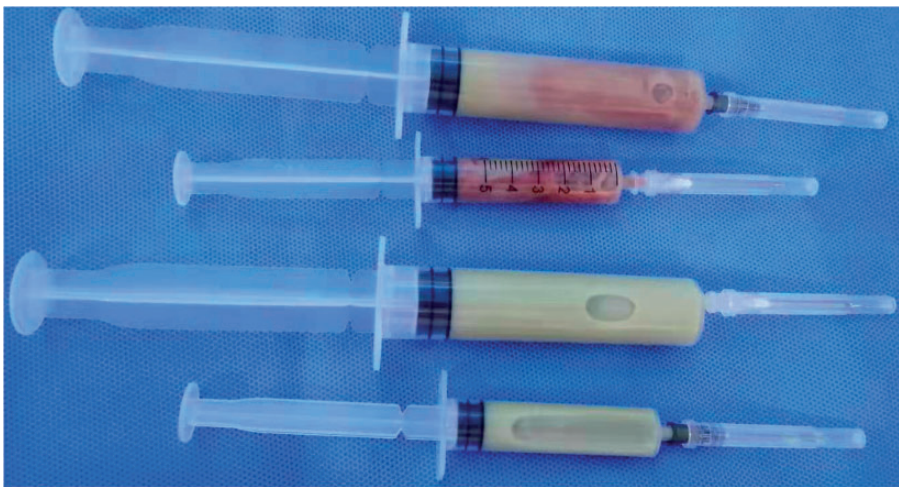


Figure 2. Pretreatment computed tomography-guided abscess puncture of a cystic solid lesion in the right costophrenic angle of a 68-year-old male patient collected purulent and bloody fluids. The colour version of this figure is available at: <http://imr.sagepub.com>.

Table 1. Drug sensitivity results for the bacterial culture of the purulent and bloody fluids from a 68-year-old male patient admitted as an outpatient with type 2 diabetes mellitus and numbness and coldness in both lower extremities with intermittent claudication for more than 1 month.

Antibacterial drug	Antibacterial concentration, MIC	Sensitivity	Folding point
Ampicillin	≥ 32	Drug resistance	$\leq 8 \geq 32$
Ceftazidime	≤ 1	Sensitive	$\leq 4 \geq 16$
Ceftriaxone	≤ 1	Sensitive	$\leq 1 \geq 4$
Ciprofloxacin	0.125	Intermediaries	$\leq 0.06 \geq 1$
Levofloxacin	0.5	Intermediaries	$\leq 0.12 \geq 2$
Cotrimoxazole	≤ 20	Sensitive	$\leq 40 \geq 80$

MIC, minimum inhibitory concentration.

abdomen showed changes in the right costophrenic angle after abscess drainage and the right costophrenic angle abscess disappeared (Figure 3). Based on this examination, the patient's life was significantly better than before treatment. A balloon dilation of the arteries in the lower extremities was performed 3 days later to relieve the patient's discomfort in both lower extremities.

Ethics committee approval was not required because of the nature of this study (case report). The reporting of this study conformed to CARE guidelines.⁶ The patient provided written informed consent for publication of this case report.

Discussion

Compared with the general population, the respiratory tract, gastrointestinal tract and skin of patients with diabetes mellitus are more susceptible to infection.⁷ It is important to note that infections increase the mortality rate of patients with diabetes mellitus.⁷ When a patient with diabetes mellitus has a coinfection, the urinary tract is the most vulnerable site for pathogenic bacteria and patients usually present with a urinary tract infection.⁸ *Escherichia coli* and *Klebsiella pneumoniae* are the most common pathogens in patients with



Figure 3. Posttreatment computed tomography examination of a 68-year-old male patient admitted as an outpatient with type 2 diabetes mellitus and numbness and coldness in both lower extremities with intermittent claudication for more than 1 month showed changes in the right costophrenic angle after abscess drainage and the right costophrenic angle abscess had disappeared.

diabetes mellitus presenting with urinary tract infections.⁸ Furthermore, diabetes mellitus can lead to abscesses when combined with infection. For example, abscesses can occur in the prostate,⁹ liver¹⁰ and brain.¹¹ During the coinfection of patients with diabetes mellitus, the site of the abscess can occur under the costophrenic. In the current patient, an abscess occurred in the right costophrenic angle. The presence of an

abscess at this site is rare and only two cases have been reported previously.^{4,5} However, the two previous case reports provided more general descriptions and lacked imaging data.^{4,5} In contrast, this current case report is relatively complete, including the complete treatment and follow-up process and it provides clear imaging data.

Fever is always a concern for clinicians as it is one of the main manifestations of infection. Persistent fever of unknown origin is a diagnostic challenge in diabetes mellitus. It is known from previous publications that fever can occur when diabetes mellitus is combined with different pathogenic bacterial infections.¹² Compared with the general population, patients with diabetes mellitus are more likely to develop endogenous bacterial endophthalmitis, which mostly presents clinically with fever caused by gram-negative bacterial infections.¹² Patients with diabetes mellitus infected with *Mycobacterium avium* can develop pathological bloodstream infections with recurrent fever as the main manifestation.¹³ Children with diabetes mellitus are susceptible to the development of dengue when Group A beta-haemolytic streptococci invade their damaged skin.¹⁴ Fever is one of the obvious manifestations of this disease.¹⁴

The combination of diabetes mellitus with *Salmonella* Dublin infection has been reported relatively rarely. Therefore, *Salmonella* Dublin infection should be considered when a patient with diabetes mellitus presents with unexplained fever that persists and worsens. Additionally, cell culture and pathogen identification can be used to confirm the diagnosis.

Based on previous experience,¹⁵ when *Salmonella* Dublin infection occurs, an appropriate antibiotic should be chosen for treatment. In addition, when a patient presents with an abscess, treatment is usually based on the use of long-term antibiotics. If the treatment is not effective, antibiotics combined with surgical drainage

can be used to relieve symptoms and improve the patient's prognosis.¹⁶ The current patient presented with a right costophrenic angle abscess caused by a *Salmonella* Dublin infection, which is rare in this area of the world. The patient presented with unexplained fever that continued to worsen. The patient was initially treated with antibiotics but these did not achieve the desired goal. CT-guided puncture and drainage of the abscess was undertaken and this normalized the patient's body temperature. In addition, the patient's symptoms of infection were controlled and the abscess in the right costophrenic angle disappeared.

In conclusion, unexplained persistent fever is a diagnostic challenge in diabetes mellitus. Infection with *Salmonella* Dublin should be considered when patients with diabetes mellitus present with these symptoms. Bacterial culture and identification tests can be used to confirm the diagnosis. Additionally, when this pathogen causes an abscess it should receive extensive attention. When the above clinical symptoms are present, antibiotics can be used as an initial treatment. It is important to note that surgical treatment by puncture is necessary. If the situation permits, early puncture is more beneficial for the diagnosis and treatment of the disease.

Author contributions

All authors made substantial contributions. Nanxi Dong collected information and wrote the first draft of the manuscript. Fujun Wang, Yuekao Li, Hongfang Ma and Na Xing collected information and produced the figures and table. Haixia Ding reviewed and revised the manuscript. All authors agreed to the content of the article and approved the final version for submission.

Declaration of conflicting interest

The authors declare that there are no conflicts of interest.

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