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Case Report

Hemorrhagic bronchitis caused by carbapenem-resistant Acinetobacter baumannii infection: A case report

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ABSTRACT

Carbapenem-resistant Acinetobacter baumannii (CR-AB) is rarely found in community respiratory infections, and there are currently no reports of hemorrhagic bronchitis caused by its infection. This work presents a case of bronchial bleeding in a diabetic patient who acquired a community-acquired infection of CR-AB. Treatment with levofloxacin was unsuccessful, as the patient's hemoptysis symptoms recur. The patient was treated with minocycline based on the drug sensitivity test, resulting in the disappearance of hemoptysis symptoms. The patient was subjected to follow-up by phone for three months and did not experience any further hemoptysis symptoms. This case highlights that CR-AB infection causes hemorrhagic bronchitis, and the antimicrobial treatment should be based on drug sensitivity results.

Although bronchitis and pneumonia caused by Acinetobacter baumannii infection are prevalent in clinical practice, no research report is currently available on bronchial bleeding caused by Acinetobacter baumannii infection [1–4]. In particular, bronchial bleeding caused by Acinetobacter baumannii may be attributed to bronchitis. Acinetobacter baumannii infection manifests with various symptoms, including cough, expectoration, and fever. Although these symptoms were also present, rapid confirmation of the diagnosis is essential to ensure adequate treatment and prevent morbidity and mortality.

1. Case report

A 54-year-old male presented to the outpatient clinic with fever, cough, yellow sputum for ten days, and hemoptysis for two days. He was a tile installer who had no history of smoking or drinking, but a history of using levofloxacin and cefuroxime during his frequent colds. He had high blood pressure for four years and diabetes for two years. The patient was treated with cephalosporin in the clinic for four days before hospitalization. His fever resolved with antibiotic treatment, but his cough and phlegm continued, and developed new onset hemoptysis, approximately 100 mL, in the last two days before arriving at the clinic. He was transferred to the emergency department because of the development of hemoptysis. The physical examination of the patient revealed that he was conscious and had a body temperature of 36.7 °C, a respiratory rate of 21 breaths per minute, a pulse rate of 100 beats per minute, and a blood pressure of 138/80 mmHg. His Pulse Oxygen Saturation (SPO2) was 95% without supplemental oxygen, with no signs of anemia or facial distress. A visual inspection of the chest showed a symmetrical thoracic cage with no rashes or deformities. Auscultation of the chest revealed symmetrical vocal resonance with no pleural friction rub. Chest percussion elicited clear sounds bilaterally, with symmetry on both sides. Lung auscultation showed clear respiratory sounds in both lungs, with no dry or wet crackles heard. However, there was reduced breath sound on the right side. No edema was present in the extremities, and all extremities were symmetrical

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in size. Computed tomography angiography (CTA) revealed right middle bronchial obstruction, right middle lobe obstructive pneumonia, and alveolar hemorrhage in the right lower lobe. No other abnormalities were detected (Fig. 1). The laboratory data showed a hemoglobin level of 135 g/L and a platelet count of 312 × 10^9/L. The prothrombin time (PT), thrombin time (TT), activated partial thromboplastin time (APTT), and international normalized ratio (INR) were 10.4, 16.6, 22.8 seconds, and 0.9, respectively. Simultaneously, fibrinogen was 3.02 g/L and erythrocyte sedimentation rate (ESR) was 15 mm/hour. At the same time, the liver function tests revealed a total bilirubin of 12.2 μmol/L, alanine aminotransferase of 33 units/L, and aspartate aminotransferase of 35 units/L. However, the white blood cell count, C-reactive protein (CRP), immunoglobulins, and lymphocytes were all within normal limits. In addition, the sputum microbiological culture was negative. The fasting plasma glucose was 8.6 mmol/L, and the glycosylated hemoglobin A1c was 9.6%. After admission, the patient was treated with pituitrin for hemoptysis, levofloxacin 0.5 g once a day for empirical anti-infection, and insulin for blood sugar control. Although his blood sugar was well-controlled, his symptoms of cough, sputum, and hemoptysis did not improve. He continued to cough up approximately 50 mL of blood per day even after two days of treatment. Additionally, the patient was not taking any anticoagulants, platelets, or other medications.

The patient underwent bronchoscopy three days after admission, and no additional findings were observed except for the obstruction of a red substance in the right middle bronchus. Microscopy did not reveal any active bleeding points in the bronchi. (Fig. 2A). The obstructed bronchus improved after the removal of the mass using biopsy forceps (Fig. 2B). The pathology of the bioptic sample indicated chronic inflammation of the bronchial mucosa with bleeding exudate (Fig. 2C). Alveolar lavage solution and brushed acid-fast staining smear was negative. The results of the drug sensitivity test for CR-AB, which was identified by bronchoalveolar lavage fluid culture, were shown in Table 1.

The patient experienced recurrent hemoptysis on the ninth day after admission, with approximately 30 mL of blood sputum per day. The bronchoscopy revealed that the right middle bronchus was again obstructed by a clot-like substance of approximately 6 cm (Fig. 3A), which was removed by cryotherapy through bronchoscopy (Fig. 3B). Thus, the right middle bronchus was clear in the BC-1T290 field of view after the removal of the obstruction (Fig. 3C). The pathological results revealed an extensive bleeding and exu-

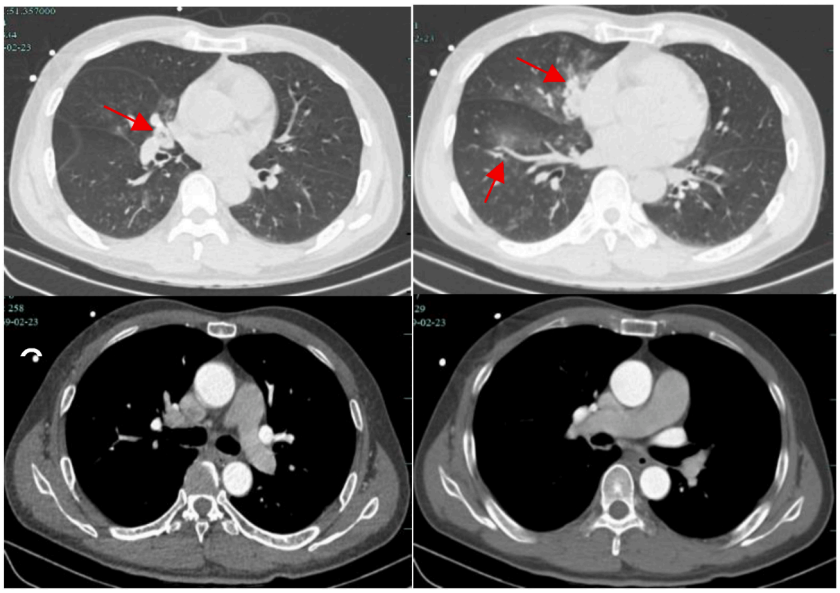

Fig. 1. (A) CTA showed right middle bronchial obstruction on the day before admission (red arrow). (B) Obstructive pneumonia and alveolar hemorrhage can be seen in the right middle lobe. In addition, alveolar hemorrhage can be seen in the lower right lobe (red arrow). (C) CTA showed no abnormalities in the bronchial artery, pulmonary artery trunk, and left pulmonary artery. (D) CTA showed no abnormalities in the bronchial artery, pulmonary artery trunk, and right pulmonary artery.

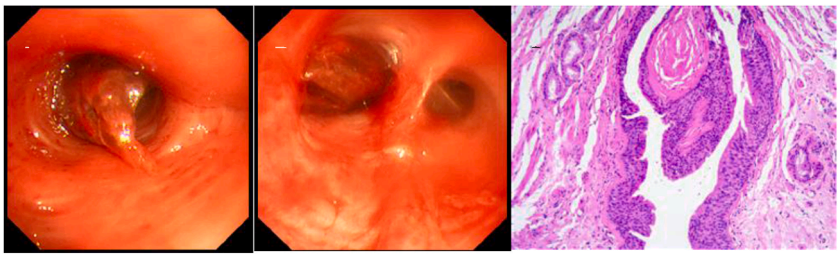

Fig. 2. (A) Bronchoscopy revealed a red substance obstruction in the right middle bronchus. (B) The obstructed bronchus improved after the removal of the mass using biopsy forceps. (C) Pathology showed chronic inflammation of the bronchial mucosa with hemorrhagic exudate.

Table 1
The drug susceptibility test results of the carbapenem-resistant Acinetobacter baumannii.

Antibacterial Drug	Method	Breakpoint	Result	Unit	susceptibility
Ampicillin/Sulbactam	MIC	≤8/4, ≥32/16	>32/16	ug/ml	resistance
Piperacillin/Tazobactam	MIC	≤16/8, ≥64/8	>64/8	ug/ml	resistance
Ceftazidime	MIC	≤16/4, ≥128/4	>128/4	ug/ml	resistance
Ceftriaxone	MIC	≤8, ≥32	>32	ug/ml	resistance
Cefepime	MIC	≤8, ≥64	>64	ug/ml	resistance
Imipenem	MIC	≤8, ≥32	>32	ug/ml	resistance
Meropenem	MIC	≤2, ≥8	>8	ug/ml	resistance
Levofloxacin	MIC	≤2, ≥8	>8	ug/ml	resistance
Ciprofloxacin	MIC	≤1, ≥4	>4	ug/ml	resistance
Gentamicin	MIC	≤4, ≥16	>16	ug/ml	resistance
Amikacin	MIC	≤16,≥64	>64	ug/ml	resistance
Tobramycin	MIC	≤4, ≥16	>16	ug/ml	resistance
Minocycline	MIC	≤4, ≥16	4	ug/ml	susceptibility
Tetracycline	MIC	≤4, ≥16	>16	ug/ml	susceptibility
Tigecycline	K–B	≤12, ≥16	17	mm	susceptibility
Polymyxin	MIC	≤2, ≥4	≤1	ug/ml	susceptibility
SMZ-TMP	MIC	≤2/38, ≥4/76	>4/76	ug/ml	resistance

SMZ-TMP, Sulfamethoxazole-trimethoprim; MIC, Minimal Inhibitory Concentration; K–B, Kirby-Bauer; mm, millimeter.

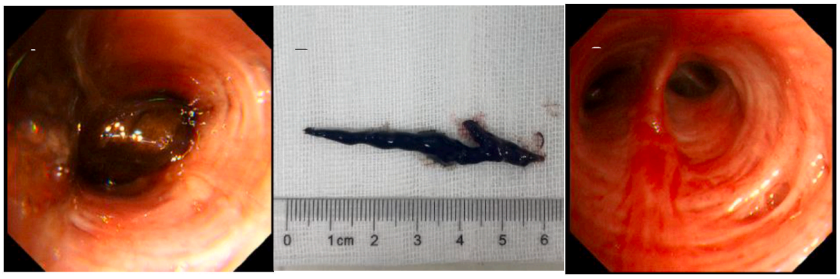

Fig. 3. (A)Bronchoscopy revealed that the right middle bronchus was again obstructed by a clot-like substance. (B) Bronchoscopy cryotherapy was used to remove about 6 cm of bronchial-like blood clots. (C) The right middle bronchus was apparent in the BC-1T290 field of view after removing the obstruction.

dated tissue, with no atypic cells. The patient continued to have blood-tinged sputum, approximately 15 ml per day. The susceptibility testing of CR-AB in the alveolar lavage cultures performed ten days after admission revealed sensitivity only to minocycline, tigecycline, and polymyxin. After a week of oral minocycline treatment 100 mg twice a day, the patient's hemoptysis disappeared, cough and sputum were also reduced. Chest CT revealed significant improvement in right middle lobe bronchial obstruction (red arrow) (Fig. 4A). Additionally, CT showed considerable improvement in absorption of right middle lobe obstructive pneumonia (red arrow) and right lower lobe alveolar hemorrhage (Fig. 4B and C). The patient was subjected to follow-up by phone for three months and did not experience any further hemoptysis symptoms.

2. Discussion

Acinetobacter baumannii is an opportunistic human pathogen that mainly infects critically ill hospitalized patients [5]. However, a study showed that community-acquired infections only occur in patients with chronic diseases, including diabetes, alcoholism, cancer, and obstructive pulmonary disease [6]. This study describes a patient with diabetes who has a community-acquired infection of CR-AB.

Regarding the patient's diagnosis, there was improvement after anti-infection treatment based on the results of microbial culture and drug susceptibility testing. Therefore, we consider a diagnosis of hemorrhagic bronchitis caused by CR-AB infection. In terms of

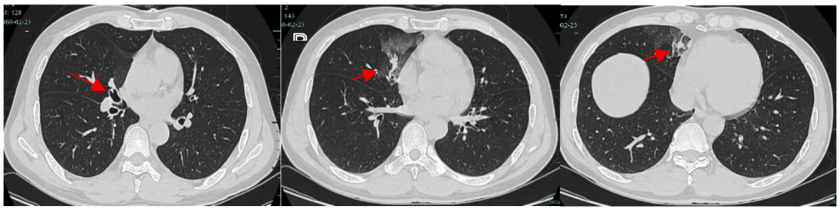

Fig. 4. (A) CT revealed significant improvement in the right middle lobe bronchial obstruction (red arrow). (B, C) CT showed significant improvement in absorption of right middle lobe obstructive pneumonia (red arrow) and right lower lobe alveolar hemorrhage.

differential diagnosis, firstly, the patient's antinuclear antibodies (ANAs) and anti-neutrophil cytoplasmic antibody (ANCA) associated vasculitis antibodies were both negative, and there was no evidence of symptoms related to connective tissue diseases (CTD), so it is not considered that the patient has a CTD. Secondly, his D-dimer level was 0.57mg/L. Although the patient did not undergo computed tomographic pulmonary angiography (CTPA), there was no evidence of pulmonary embolism in the CTA performed before admission. Therefore, it is not considered that he has pulmonary embolism. Finally, his sputum smear, bronchoalveolar lavage fluid, and brush acid-fast staining were negative, so tuberculosis infection was also ruled out.

Although a report is available on hemoptysis in a patient with Pigeon paramyxovirus-1 combined with Acinetobacter baumannii pneumonia [7], no literature reports are currently available on hemoptysis symptoms caused by Acinetobacter baumannii. Although the patient exhibited symptoms of yellow phlegm and hemoptysis, his white blood cell count and CRP were within the normal range. Therefore, when CR-AB in his alveolar lavage fluid was cultured, we believed empirically that it might be a fixed value bacterium. The empirical treatment with levofloxacin did not result in the reduction of yellow phlegm and hemoptysis, and he improved after the treatment with minocycline, which was administered according to drug sensitivity.

Infection with CR-AB can cause bronchial bleeding, but this result requires further confirmation from a large sample study. When a patient with hemoptysis is confirmed to be infected with Acinetobacter baumannii, it is recommended to conduct an antibiotic treatment based on drug sensitivity results.

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Role of sponsors

The sponsor had no role in the design of the study, the collection and analysis of the data, or the preparation of the manuscript.

Other contributions

The authors would like to express their gratitude to the patient for consenting to publication of his case.

Ethics statements

Patient consent for publication. Consent obtained directly from patient.

Ethics approval

This study involves human participants but the Ethics Committee of The Fourth Affiliated Hospital, Zhejiang University School of Medicine exempted this study. Participants gave informed consent to participate in the study before taking part.

Declaration of competing interest

The authors declare that they have no competing interests.

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Abbreviation

CR-AB	Carbapenem-resistant Acinetobacter baumannii
SPO2	Pulse Oxygen Saturation
CTA	computed tomography angiography
PT	prothrombin time
TT	thrombin time
APTT	activated partial thromboplastin time
INR	international normalized ratio
ESR	erythrocyte sedimentation rate
CRP	C-reactive protein
CT	Computed Tomography
ANAs	antinuclear antibodies
ANCA	anti-neutrophil cytoplasmic antibody
CTD	connective tissue diseases
CTPA	computed tomographic pulmonary angiography
SMZ-TMP	Sulfamethoxazole-trimethoprim
MIC	Minimal Inhibitory Concentration
K–B	Kirby-Bauer

mm millimeter

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