

Chlamydia Abortus-Induced Pneumonia with Psychiatric Symptoms and Pneumomediastinum: A Case Report

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Background: Chlamydia abortus is a zoonotic pathogen that commonly causes abortion, pelvic inflammatory disease, or septicemia during pregnancy in humans. It can occasionally lead to pneumonia.

Case Presentation: We report a 35-year-old male with pneumonia complicated by psychiatric symptoms and pneumomediastinum. Initial treatment with cefotaxime and piperacillin-tazobactam failed. On admission, chest CT revealed bilateral pulmonary inflammation, pneumomediastinum, and cervical subcutaneous emphysema. Bronchoalveolar lavage fluid underwent Targeted Next-Generation Sequencing, identifying Chlamydia abortus. Treatment with doxycycline and moxifloxacin led to resolution of fever, psychiatric symptoms, and pulmonary lesions. The patient continued oral doxycycline post-discharge, and follow-up CT showed near-complete recovery.

Conclusion: Chlamydia abortus infection can cause pneumonia with psychiatric symptoms, pneumomediastinum, and cervical emphysema—complications not previously reported. Targeted Next-Generation Sequencing (Targeted NGS) plays a crucial role in the early and precise detection of Chlamydia abortus, improving diagnostic accuracy and treatment timeliness. Doxycycline is effective in the treatment of Chlamydia abortus infection and contributed to the patient's recovery.

Keywords: Chlamydia abortus, pneumonia, psychiatric symptoms, pneumomediastinum, next-generation sequencing, case report

Introduction

Chlamydia is a type of obligate intracellular parasitic bacterium, a Gram-negative prokaryotic microorganism that undergoes a biphasic developmental cycle consisting of an extracellular and an intracellular phase.^{1,2} Chlamydia abortus belongs to the genus Chlamydia and is also a zoonotic pathogen. It commonly causes miscarriage, pelvic inflammatory disease, or septicemia during pregnancy in humans.³ In recent years, with the advancement and widespread application of next-generation sequencing (NGS) technology, Chlamydia abortus has also been increasingly recognized as a cause of human pneumonia. However, there have been no previously reported cases of Chlamydia abortus infection complicated by pneumomediastinum or psychiatric symptoms. We report a rare case of pneumonia caused by Chlamydia abortus complicated with psychiatric symptoms and pneumomediastinum. The objective of this report is to highlight the clinical features, diagnostic approach, and effective treatment strategies for C. abortus-induced pneumonia, thereby expanding the known clinical spectrum and providing guidance for future cases.

Case Presentation

A 35-year-old male salesperson with no history of smoking had contact with parrots about two weeks prior to symptom onset and began experiencing fever, cough, and sputum production 12 days before admission. Four days prior to presentation, he visited a local hospital with a body temperature of 40°C, accompanied by headache, profuse sweating,

chills, cough, and yellow sputum that was copious and viscous. Cranial CT scan at the local hospital showed no abnormalities. Chest CT scan revealed inflammation in the left lower lung, and the diagnosis of “community-acquired pneumonia” was made. He was treated sequentially with cefotaxime and piperacillin-tazobactam for 4 days without improvement, and was therefore transferred to our hospital. Chest CT re-examination at our hospital showed bilateral pulmonary inflammation (more severe on the left), cervical and mediastinal emphysema, and a possible bone island in the left scapula (Figure 1A–D, i–iii). The patient had been previously healthy. On admission, physical examination showed:

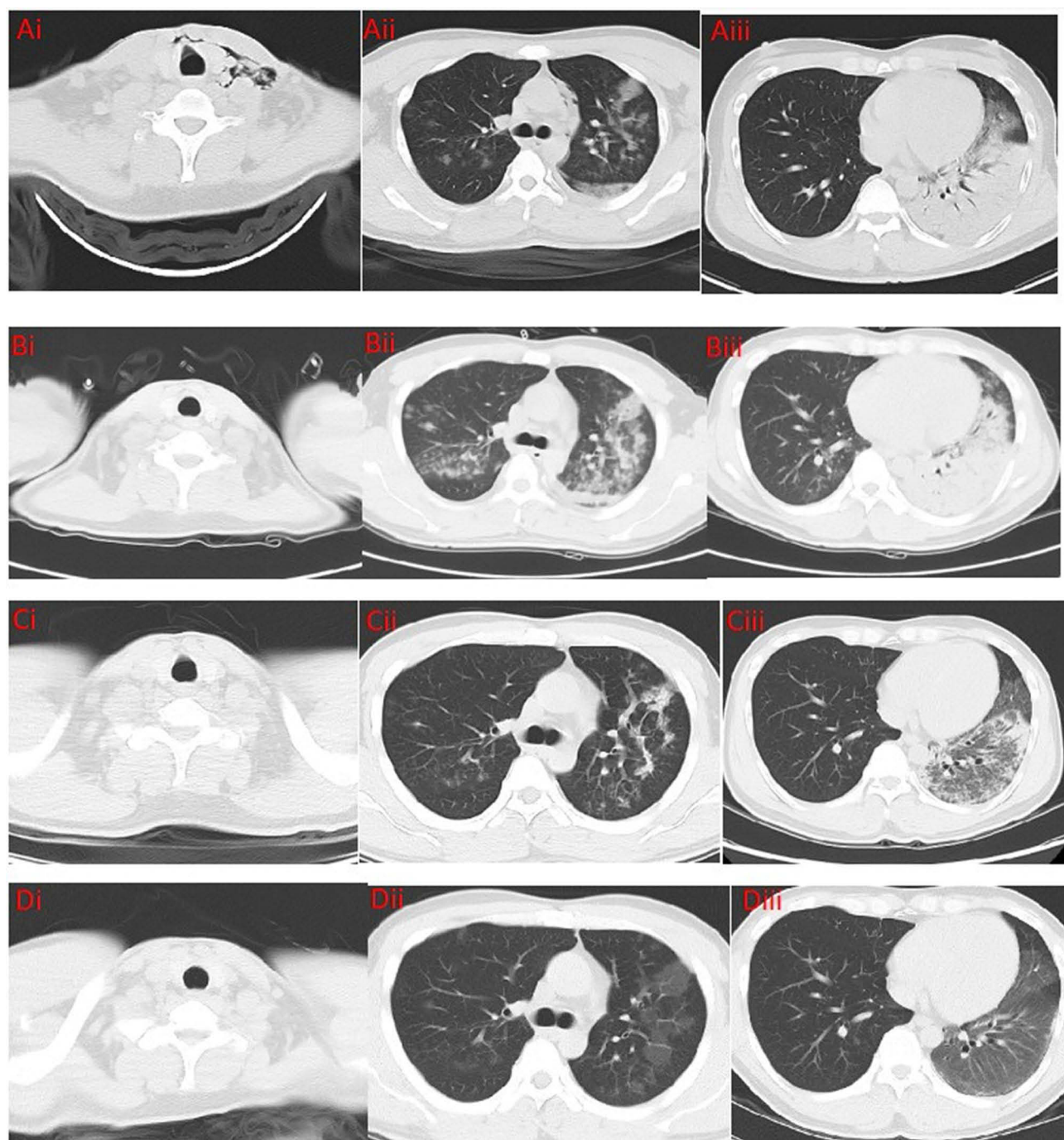


Figure 1 Chest computed tomography (CT) imaging analysis of the patient. Images on the day of admission (**Ai–iii**) show bilateral pulmonary inflammation, consolidation in the left lower lung, and cervical-mediastinal emphysema. Follow-up CT on day 4 after admission (**Bi–iii**) reveals increased inflammation in the left lung compared to previous imaging, left pleural effusion, and resolution of cervical-mediastinal emphysema. CT on day 14 after admission (**Ci–iii**) demonstrates partial absorption of the pneumonia. At outpatient follow-up two weeks after discharge (**Di–iii**), bilateral pulmonary lesions are nearly completely absorbed.

temperature 39°C, pulse 120 beats/min, respiration 21 breaths/min, blood pressure 126/73 mmHg. The patient was irritable, exhibited disorganized speech, and provided inconsistent accounts of symptoms, coarse breath sounds in both lungs with scattered moist rales, normal knee and Achilles tendon reflexes, and negative bilateral Babinski signs. Arterial blood gas analysis on admission (nasal oxygen 5 L/min) showed pH 7.538, PCO₂ 30.8 mmHg, PO₂ 94.2 mmHg, SaO₂ 97.8%, oxygenation index 230. Laboratory results included white blood cell count $6.77 \times 10^9/L$, neutrophil percentage 87.2%, hemoglobin 112 g/L, platelet count $173 \times 10^9/L$, procalcitonin 2.56 ng/mL, C-reactive protein 262.65 mg/L, D-dimer 1.48 mg/L, Mycoplasma pneumoniae IgM negative, albumin 27.7 g/L, potassium 2.63 mmol/L, sodium 131.1 mmol/L, elevated transaminases, normal renal function, significantly elevated CK and CK-MB, and LDH 749 IU/L (Table 1). Diagnosis: sepsis secondary to community-acquired pneumonia with associated cervical and mediastinal emphysema, (SOFA score = 2). After admission, the patient was treated with oral doxycycline (100 mg every 12 h) in combination with intravenous cefoperazone–sulbactam (3.0 g every 8 h), along with nasal oxygen therapy and intermittent prone-position ventilation. Bronchoscopy revealed purulent changes in the basal segment of the left lower lobe (Figure 2), and targeted next-generation sequencing was performed on bronchoalveolar lavage fluid.

Table 1 Vitals and Laboratory Findings

Date	Day1	Day3	Day4	Day6	Day14
Symptom	Cough, expectoration, fever	Cough, expectoration, fever; Headache	Occasional cough and expectoration, fever	Occasional cough and expectoration	Occasional dry cough noted
Temperature spikes	39.0°C	38.5°C	37.7°C	37.0°C	36.5°C
Psychiatric symptoms	Irritable, contradictory speech, uncooperative with physical examination	Irritable, contradictory speech, uncooperative with physical examination	Calm mood, improved headache, appropriate responses, cooperative with physical examination	Calm mood, improved headache, appropriate responses, and cooperative with physical examination	Unable to recall events during the period of psychiatric disturbance
PH (7.35–7.45)	7.538	–	–	–	–
PaO ₂ (80–100 mmHg)	94.2	–	–	–	–
PaCO ₂ (35–45 mmHg)	30.8	–	–	–	–
PaO ₂ /FiO ₂	230	–	–	–	–
WBC ($3.5\text{--}9.5 \times 10^9/L$)	6.77	4.15	–	8.48	5.12
NE (40–75%)	87.2	76.9	–	70.1	52.9
LYMPH (20–50%)	9.7	14.9	–	23.8	41.8
CRP (0.06–8.2mg/L)	262.65	115.65	–	18.04	1.32
PCT (0–0.5 ng/mL)	2.56	0.67	–	0.14	–
IL-6 (<7 pg/mL)	54.29	55.9	–	5.4	–
HBP (0–10 ng/mL)	30.8	–	–	–	–
ALB (40–55 g/L)	27.7	28.1	–	35.2	36.9
ALT (9–50 U/L)	100	77	–	53	24
AST (15–40 U/L)	192	89	–	97	41
CRE (57–97umol/L)	94	66	–	–	67
CK (50–310U/L)	1951	197	–	–	198
CK-MB (0–25 IU/L)	47	13	–	–	14

(Continued)

Table 1 (Continued).

Date	Day1	Day3	Day4	Day6	Day14
LDH (120–250IU/L)	749	390	–	–	201
Na (137–147 mmol/L)	131.1	142.5	–	–	143.7
K (3.5–5.3 mmol/L)	2.63	3.76	–	–	3.98
D-Dime (0–0.24 mg/L)	1.48	–	–	–	0.55
Chest CT findings	Pulmonary inflammation, cervical-mediastinal emphysema	–	Pneumonia has progressed, the mediastinal emphysema is resolving.	–	Pneumonia is partially resolved
Antibiotic therapy plan	Doxycycline combined with cefoperazone-sulbactam	Doxycycline combined with cefoperazone-sulbactam	Oral doxycycline combined with moxifloxacin	Oral doxycycline combined with moxifloxacin	Oral doxycycline combined with moxifloxacin

On day 3 after admission, additional tests revealed elevated inflammatory markers, including interleukin-6 (IL-6) at 54.29 pg/mL, interleukin-10 (IL-10) at 64.94 pg/mL, and tumor necrosis factor- α (TNF- α) at 7.47 pg/mL. Serum (1,3)- β -D-glucan (G test) was elevated at 78.72 pg/mL, while serum galactomannan (GM) remained within the normal range. Nucleic acid tests for influenza A and B viruses, adenovirus, SARS-CoV-2, rhinovirus, respiratory syncytial virus, and human metapneumovirus were all negative. Sputum smear did not detect any pathogenic bacteria. Human cytomegalovirus (CMV) nucleic acid test was negative. Epstein-Barr virus (EBV) core antigen IgG and capsid antigen IgG were elevated. Repeat blood routine tests showed: white blood cell count $4.15 \times 10^9/L$, neutrophil percentage 76.9%, hemoglobin 122 g/L, platelet count $226 \times 10^9/L$, procalcitonin 0.67 ng/mL, C-reactive protein 115.65 mg/L, and improved transaminase levels. Bronchoalveolar lavage fluid cytology classification showed neutrophils 92%, lymphocytes 4%, macrophages 4%. tNGS report (Darui Diagnostics Medical Laboratory Co., Ltd., China) of the lavage fluid: Chlamydia abortus, normalized sequence

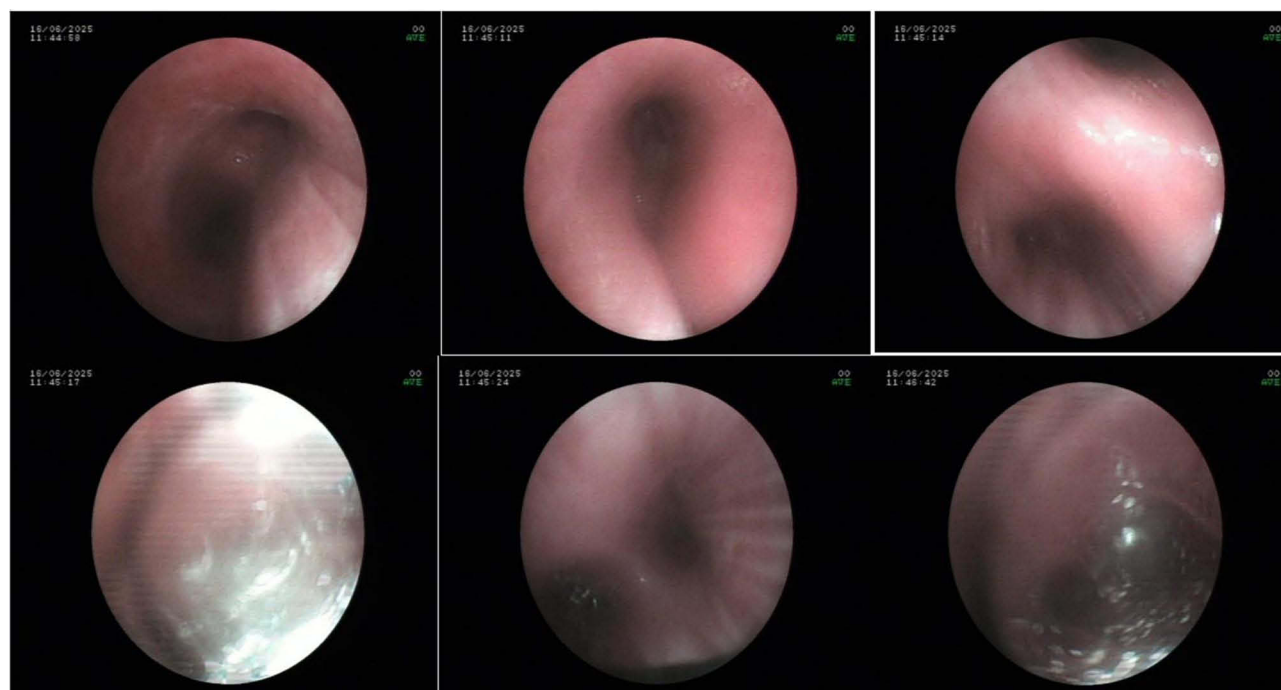
**Figure 2** Bronchoscopic images.

Table 2 The Patient's tNGS Test Results

Genus	Species	Normalized Read Count	Estimated Pathogen Concentration (Copies/mL)
Chlamydia	Chlamydia abortus	142107	10 ⁵
Haemophilus	Haemophilus parainfluenzae	78	10 ¹
Staphylococcus	Staphylococcus epidermidis	50	10 ¹
Lymphocryptovirus	Human gammaherpesvirus 4	728	10 ²

count 142,107; *Haemophilus parainfluenzae*, sequence count 78; *Staphylococcus epidermidis*, sequence count 50; Epstein–Barr virus (EBV), sequence count 728; no resistance genes detected (Table 2). Due to the patient's irritability and inability to cooperate, lumbar puncture was not performed. On day 4 of admission, the patient's temperature returned to normal, cough and sputum improved, headache relieved, consciousness clear, responses relevant, facial expression natural, and cooperative during examination. SaO₂ was 97% (oxygen via nasal cannula at 3 L/min). Repeat chest CT showed bilateral pulmonary inflammation, more pronounced on the left and increased compared to prior imaging, with increased left pleural effusion and absorption of cervical and mediastinal emphysema (Figure 1A–D, i–iii). Cefoperazone-sulbactam was discontinued, and oral doxycycline (100 mg every 12 h) combined with intravenous moxifloxacin (400 mg once daily) was continued for anti-infection therapy. Blood cultures were negative on hospital day 5. On day 14 of admission, repeat blood routine, liver and kidney function, electrolytes, LDH, and CRP were all within normal ranges. Repeat chest CT showed absorption of pulmonary inflammation compared to previous images (Figure 1A–D, i–iii), and the patient improved and was discharged. Upon recalling the course of illness, the patient could only remember events near the time of discharge; events occurring during the period of psychiatric symptoms were not remembered, while previous memories were intact without confusion. After discharge, The patient continued oral doxycycline tablets (100 mg every 12 hours) for 15 days. Follow-up chest CT showed near-complete absorption of bilateral pulmonary inflammation (Figure 1A–D, i–iii). The patient was followed up by telephone two months after discharge. No symptoms such as cough, sputum, headache, or fever were reported. However, the patient still had vague memories of the period of psychiatric disturbance during hospitalization and was unable to recall specific details, while memory of events before and after that period remained clear.

Discussion

We report a 35-year-old male with rare *Chlamydia abortus* pneumonia complicated by psychiatric symptoms and pneumomediastinum. He presented with fever, cough, and bilateral pulmonary infiltrates. Initial labs suggested infection, and empirical therapy with doxycycline and cefoperazone-sulbactam was started due to prior β -lactam failure and parrot exposure. Conventional tests were negative, prompting targeted next-generation sequencing (tNGS), which identified *C. abortus* as the predominant pathogen. Therapy was then adjusted to doxycycline plus moxifloxacin, resulting in rapid clinical, laboratory, and radiological improvement. This case demonstrates a stepwise diagnostic approach from empirical therapy to pathogen-specific treatment for a rare zoonotic infection.

Chlamydia abortus can infect humans and cause pneumonia. We performed a systematic search for published cases of human *Chlamydia abortus* pneumonia from January 1, 1980, to June 30, 2025. Chinese studies were retrieved from CNKI using the keywords “*Chlamydia abortus*” AND “pneumonia,” and international studies were identified through PubMed and Web of Science using the same strategy. After screening, 14 articles met the inclusion criteria, including both single case reports and studies describing multiple patients. Together with the present case, 15 articles were included, encompassing 31 patients worldwide (Supplementary Table 1). To reduce the risk of duplicate reporting, we cross-checked hospitals, years, ages, and other clinical details, and no overlapping cases were found, indicating that these data are reliable. Among the 31 patients, 20 were male and 11 female. Fever was present in all cases, and 27 (87.1%) had a history of contact with animals or aborted animals. Most diagnoses were confirmed using NGS. Sixteen patients (51.6%) developed respiratory failure, 27 recovered and were discharged, and 4 died. In recent years, with the increasing maturity of metagenomic next-generation

sequencing (mNGS) technology, cases of *Chlamydia abortus* pneumonia have been reported with increasing frequency worldwide. In 2016, Spanish researchers first identified *Chlamydia abortus* as a causative agent of human pneumonia.⁴ During a 2022 outbreak of avian-origin *Chlamydia abortus* infection in the Netherlands, possible human-to-human transmission was suggested.³ Most patients had a history of poultry exposure and presented with high fever, respiratory symptoms, dyspnea, and, in some cases, altered consciousness.^{5–8} Severe clinical manifestations included pneumonia,^{9–11} infectious shock,^{12,13} and hemophagocytic syndrome.¹⁴ Laboratory findings often included markedly elevated inflammatory markers and severe hyponatremia, while chest CT commonly revealed pneumonia with consolidation. All cases were confirmed by next-generation sequencing (NGS). In severe cases, life support measures such as prone-position ventilation, endotracheal intubation, and extracorporeal membrane oxygenation (ECMO) were sometimes required.^{12–14} Administration of doxycycline alone or combined with other agents for approximately two weeks led to improvement in most patients,^{5–14} however, a small number ultimately succumbed to the infection. *Chlamydia abortus* can also be found in immunosuppressed individuals.¹⁵ *Chlamydia abortus* can co-infect with *Chlamydia psittaci*, leading to mixed infections. Patients with mixed infections tend to have more severe illness and may die.¹⁶ To date, no cases of *Chlamydia abortus* pneumonia complicated by pneumomediastinum or psychiatric symptoms have been reported. Only two cases of *Chlamydia trachomatis* pneumonia complicated by pneumothorax have been described in the literature, both in infants, who improved after appropriate supportive and anti-infective treatment.^{17,18}

Cervicofacial emphysema is the abnormal accumulation of air within the subcutaneous tissues of the face and neck and is generally self-limiting and non-life-threatening. It can be accompanied by pneumomediastinum and pneumothorax. Common causes include iatrogenic procedures, trauma, and sudden increases in intrathoracic pressure due to severe coughing, vomiting, or physical exertion.¹⁹ Spontaneous pneumomediastinum, more frequent in young males, may also be triggered by infections, immune hyperactivation (cytokine storm), microthrombosis, or obesity. The pathogenesis typically involves sudden alveolar pressure elevation, leading to alveolar rupture and air leakage from the interstitial and bronchovascular tissues into the mediastinum.²⁰ Secondary pneumomediastinum arises from trauma, intrathoracic infection, or mechanical ventilation.²¹ In our patient, there was no recent surgery, trauma, or mechanical ventilation. Cervical and mediastinal emphysema occurred during the disease course and resolved after infection control, likely related to severe coughing, pulmonary infection, and Valsalva maneuvers.

Concurrently, prominent psychiatric symptoms developed early in the disease course and progressed in parallel with the systemic infectious process, manifesting as marked agitation, behavioral disturbance, and a clinical picture consistent with hyperactive delirium. In the context of severe pneumonia and sepsis, such acute neuropsychiatric manifestations are commonly attributed to systemic inflammation, hypoxia, and metabolic dysregulation, rather than to primary central nervous system pathology. Pro-inflammatory cytokines, particularly IL-1 β , IL-6, and TNF- α , are known to exert profound effects on the central nervous system. They activate microglia, alter neurotransmitter signaling, increase blood–brain barrier permeability, and induce cerebral oxidative stress, directly contributing to acute cognitive and behavioral disturbances.^{22–24} In pneumonia patients, such neuroinflammatory changes are clinically associated with delirium and acute cognitive dysfunction.²⁵ Pneumonia can progress to sepsis, and up to 70% of septic patients develop sepsis-associated encephalopathy (SAE),²⁶ a diffuse brain dysfunction distinct from delirium and likely driven by neuroinflammatory mechanisms.²⁷ In our patient, multiple inflammatory markers—including C-reactive protein, procalcitonin, IL-6, IL-10, and TNF- α —were markedly elevated, fulfilling the diagnostic criteria for sepsis and reflecting a severe systemic inflammatory response. Neuroimaging showed no structural abnormalities, effectively excluding other primary neurological causes such as intracranial infection, hemorrhage, or space-occupying lesions. Meanwhile, targeted next-generation sequencing identified *Chlamydia abortus* as the predominant pathogen, further confirming an active infection as the underlying trigger. Notably, following targeted antimicrobial therapy and progressive control of systemic inflammation, the patient's psychiatric symptoms gradually resolved in close temporal association with clinical improvement. Taken together, the parallel evolution of psychiatric symptoms and infection severity, the marked systemic inflammatory response, and the reversibility of symptoms after source control strongly support the interpretation that the neuropsychiatric manifestations in this case were secondary to infection-driven systemic inflammation. While SAE cannot be entirely excluded, its pathophysiological basis also centers on inflammation-mediated diffuse brain dysfunction, consistent with the mechanistic explanation observed in our patient.

However, this case has several limitations. The patient initially presented to an outside hospital with headache, and cranial CT was unremarkable; psychiatric symptoms developed only after admission to our hospital. Recommended evaluations—including cranial MRI, EEG, urine drug screening, and lumbar puncture—could not be performed due to patient agitation. Vital signs remained stable, and psychiatric symptoms improved alongside fever resolution under effective anti-infective therapy. Based on available data—including clinical presentation, infection markers, and chest CT—the psychiatric symptoms were suspected to be associated with *Chlamydia abortus* infection; however, objective evidence is lacking, and other causes, such as metabolic or septic encephalopathy and primary CNS disorders, cannot be excluded. This limitation highlights the challenges of assessing neuropsychiatric symptoms in systemic infections when invasive testing is restricted. Clinicians should remain vigilant for neuropsychiatric complications and consider both infectious and non-infectious etiologies. Future cases would benefit from comprehensive neurological evaluation, which may help clarify causal relationships and guide more effective diagnostic and therapeutic strategies.

Conclusion

In summary, with advances in diagnostic techniques, *Chlamydia abortus* pneumonia has gained increasing clinical recognition. We report a rare case complicated by cervical–mediastinal emphysema and psychiatric symptoms, broadening the clinical spectrum of this infection. Next-generation sequencing enabled rapid pathogen identification and guided targeted therapy. Doxycycline-based treatment led to marked clinical and radiological improvement, supporting its effectiveness against *Chlamydia abortus* infection.

Data Sharing Statement

The original contributions presented in this study are included in this article/[supplementary material](#), further inquiries can be directed to the corresponding author.

Ethics Approval and Consent to Participate

The study involving human participants was reviewed and approved by the Ethics Committee Review Board of the Longyan First Affiliated Hospital of Fujian Medical University (Approval No.: LYREC2025-K156-01). The study was conducted in accordance with local regulations, institutional requirements, and the principles of the Declaration of Helsinki. Institutional approval was required and obtained from the Ethics Committee Review Board of the Longyan First Affiliated Hospital of Fujian Medical University for the publication of the case details. Written informed consent was obtained from the patient for publication.

Consent for Publication

Written informed consent was obtained from the patient for publication.

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Disclosure

The authors declare that they have no competing interests.

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