



Curious Case Series of *E. coli* in Pleural Fluid Misdiagnosed as Tuberculosis

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Case Report

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Abstract

E. coli infections in the lungs are commonly overlooked because they are infrequent. There is a scarcity of information in the literature about the specifics of *E. coli*'s involvement in the respiratory system. It is a case series of three ICU patients who had *E. coli* chest infections. This report highlights the importance of having early culture and sensitivity of pleural effusion to ensure sensible antibiotic treatment. It indicates that there is a need for a thorough examination of antibiotic resistance in hospital settings, and infection control that limits the unnecessary use of extended spectrum cephalosporins and carbapenems is critical.

Keywords: *E. coli*; Piperacillin; Tazobactam; Amikacin; Cephalosporins; Carbapenems

Abbreviations: AST: An Aspartate Aminotransferase; ALT: An Alanine Transaminase; Anti-Tuberculosis Treatment (ATT); ZN: Ziehl-Neelsen.

Introduction

E. coli is normally found in the human intestine. It is a facultative anaerobe that is commonly found in the gastrointestinal system, urogenital tract, and peritoneum. Infection at a distal site might occur infrequently after bacteraemia. However, the association with pulmonary infection is rare. The extraintestinal pathogenic *E. coli* pathovar is identified by the phylogenetic and genomic properties of *E. coli* that produce pneumonia in critically ill individuals. They also have unique lung attributes [1]. Because *E. coli* infection of the lungs is rare, it is often overlooked. Aspiration of gastric contents is one of the most prevalent ways for infection to spread. We present a case series of three patients with *E. coli* chest infections who were admitted to the ICU.

Cases Presentation

Case 1

A 20-year-old female reported to our hospital with complaints of right-sided chest pain and loss of appetite in the past 2 months. She did not reveal any other significant history. On examination, her PR was 110/min, her BP was 94/64 mmHg, and her temperature was 38.2 C. The chest examination revealed a right-sided pleural effusion with no other abnormalities. TLC counts were 6800/ul (88% neutrophils, 4% lymphocytes), Hb was 9.8 g/dl, platelets were 1.22 lakhs, BUN was 16 g/dl, and serum creatinine was 0.4 mg/dl when the patient was admitted. The patient's liver function tests were normal, with a total bilirubin level of 1.4 (DB-0.5 and ID-0.9), an aspartate aminotransferase (AST) of 29, and an alanine transaminase (ALT) of 38.

An X-ray of the chest reveals a right-sided pleural effusion. After 12 days of admission and anti-tuberculosis

treatment (ATT) intake, which was started based on clinical diagnosis, the patient developed a yellow discoloration of her eyes and had 10–12 episodes of vomiting. She also had three episodes of abnormal movements with urinary incontinence. The patient was examined again, and the liver function test revealed a 5.5 (Direct bilirubin 3.0 and Indirect bilirubin 2.5) total bilirubin level, an AST of 63, and an ALT of 54. An MRI of the brain was done, which shows exudate along with the basal cisterns, quadrigeminal, pre-pontine, and pre-midullary areas. To prevent seizures, the patient was given injections of levetiracetam.

After 15 days, an intercostal tube was inserted to relieve pleural effusion on the right side, which was causing the patient dyspnoea and pain. 1 litre of purulent, thick fluid (consistent with empyema) was drained. A pleural fluid culture report reveals a culture of *E. coli* with sensitivity to amikacin, piperacillin, and tazobactam. Antibiotic therapy with amikacin 15 mg/kg IV injection began OD and piperacillin/tazobactam 4.5 g TID was started. The patient's shortness of breath and right-sided chest pain persisted after three days, prompting a CT thorax, which revealed extensive right-sided pleural effusion. Based on these findings, cardiothoracic surgeons were consulted, and right-sided lung decortication and lobectomy were performed. After one week on oral ATT, antibiotics, and Inj. levetiracetam, the patient was discharged with an improving condition.

Case 2

A 65-year-old known diabetic female came with a complaint of pain in the left side of the lower chest and a cough for 1.5 years. The cough was productive, intermittent during the day, exacerbated by the cold and physical exertion, and relieved after antitussives were taken. She also complained of intermittent low-grade fever that was relieved by antipyretics, was not associated with vomiting, headache, or diarrhoea, and was aggravated by physical exertion. Since last month, the symptoms had been gradually worsening and had not improved despite medication. She had started experiencing episodes of fever, chills, and night sweats. She had also had shortness of breath and chest pain for the last 15 days, which was interfering with her daily activities.

The patient had a PR of 110/min, a BP of 108/70, a SpO₂ of 94% on room air, a temperature of 38.1°C, and a RR of 22/min on examination. A pleural effusion was discovered during a chest examination and confirmed by a chest X-ray.

The patient was investigated for tuberculosis, pleural fluid tapping was done, which showed no AFBs on Ziehl-Neelsen (ZN) staining. Pleural fluid culture and sensitivity were also done, and bacterial colony morphology suggestive of *E. coli* on conventional culture was seen which were sensitive to piperacillin/tazobactam.

Resistance to first-line antibiotics was confirmed by the antibiotic susceptibility test, and ESBL was confirmed. A chest tube was inserted, and the effusion was drained. She was started on IV meropenem for the treatment of the infection and shifted to the ICU for monitoring and further management. She was discharged on ATT and antibiotics.

Case 3

This is the case of a 40-year-old male patient who presented with fever, chills, cough, and weakness for the last 10 days. The fever was high grade, continuous, relieved on taking medication, associated with chills and rigor, but not associated with vomiting or abdominal pain. He also had a cough with expectoration, aggravated by lying down in the left lateral position, not relieved by medications. He had also been complaining of generalised weakness and lethargy for the past 10 days.

On examination, he was found to be in respiratory distress, with a fever of 39.2 °C, PR–128/min, BP – 114/88, SpO₂–80% on room air with laboured breathing. The chest examination was suggestive of consolidation in the left lower lobe. The chest X-ray revealed opacity in the left lower lobe as well as effusion.

The patient was intubated, a chest tube was inserted to relieve the respiratory distress, and the aspirate was sent for culture and sensitivity. The patient was empirically started on anti-tubercular therapy. On the culture report, however, bacterial growth suggestive of *E. coli* was seen, and low susceptibility was observed for ampicillin, tetracycline, and amoxicillin. Maximum sensitivity was seen for carbapenems. The patient was shifted to inj. Meropenem 1.5 g TID along with adjunct medications.

Clinical and radiological improvement was seen within two days. The patient was extubated, the chest tube was removed after three days of starting therapy, and the patient was discharged after one week of observation with supportive medications and chest physiotherapy.

Discussion

According to Indian standards for tuberculosis management, individuals having a cough that lasts for more than two weeks and does not respond to antibiotic treatment with radiographic imaging of pulmonary tuberculosis should be treated as 'sputum negative pulmonary tuberculosis' when no AFB is found in sputum staining. For such patients, ATT should be started [2]. However, this comes with a risk of antibiotic resistance in cases where the underlying pathogen is not TB. In our patients, for instance, the infection was later diagnosed to be non-tubercular, when ATT had already been

started for days, and sometimes weeks.

The quick emergence of multidrug-resistant bacteria is a major public health threat. Clinical treatment becomes a continuous challenge due to the evolution of new variants of resistant bacteria. Therefore, it becomes a global challenge for health care workers and physicians. Extensive misuse of antibiotics is the major cause of their resistance. Alexander Fleming warned about antibiotic overuse, saying that the “public will demand [the drug and] ... then will begin an era ... of abuses” [3].

Infection with *E. coli* is rare in the pulmonary system [4]. According to Tillotson and Lerner, only 0.7% of pneumonia cases at the Detroit Receiving Hospital have been linked to *E. coli* [5]. A single case report was previously reported with an *E. coli* infection present in the sputum of a patient with bronchiectasis [6]. Chronic illness, particularly diabetes mellitus, kidney diseases, COPD, and chronic alcoholism are the risk factors. Harsha NS, et al. [7] reported a rare case of *Escherichia coli* infection causing bilateral cavitating necrotizing pneumonia in a 67-year-old male with uncontrolled type 2 diabetes mellitus [7]. One of the patients in our case was immunocompromised and admitted to our hospital for a long time. Infections with *E. coli* pneumonia are more commonly hospital acquired than community acquired [6,8,9]. *E. coli* may infect the respiratory system secondary to aspiration of secretions from the oropharynx or by spreading through the blood from the infection of the gastrointestinal or genitourinary systems [6].

In a cohort study by Edwards BD, et al. [10] *Escherichia coli* infections with cystic fibrosis were found in the sputum samples of 12.3% of patients between 1978 and 2016, and 40% of those patients developed a persistent infection. The risk factors for persistent infection were poor nutritional status and poor lung function [10]. Messika, et al. determined that the resistance of antibiotics and genotypic aspects of *E. coli* isolates were the keys responsible for ventilator-associated pneumonia in ICU patients. Furthermore, they conclude that the isolates were highly virulent, explicit extraintestinal pathogenic *E. coli* strains with virulence factors, implying key objectives for various treatments [11]. El-Mokhtar, et al. observed colistin resistance in 15% of the nosocomial *E. coli* isolates. These high colistin resistance rates were observed in *E. coli* strains isolated from patients with nosocomial pneumonia in the chest ICU [12]. In one of our cases, the patient had a pleural culture showing *E. coli* growth, which the patient had not responded to previously on empirical treatment. In one case, the empyema was so distressing to the patient that lung decortication was required to relieve the clinical condition of the patient, although an intercostal tube had been inserted previously.

The literature has a paucity of information regarding the details of the involvement of the respiratory system by *E. coli*, so early detection is important for the proper antibiotic treatment. We wish to emphasise the early culture and sensitivity of the pleural effusion to ensure rational use of antibiotics and thereby decrease antibiotic resistance. Our observations indicate that there is a need for thorough scrutinising of antibiotic resistance in hospital settings, and infection control policies ought to contain the unwarranted usage of extended spectrum cephalosporins and carbapenems are crucial.

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