**Clostridium perfringens** empyema in a patient with metastatic squamous cell carcinoma of the lung

Daniel Jungmyung Oh, Stephen Brecher¹, Marcus Ruopp²

**ABSTRACT**

We report a rare case of **Clostridium perfringens** (CP) empyema in a patient with metastatic squamous cell cancer of the lung. Clostridial empyemas are rare and clinically variable with some reports noting consequent necrotizing infections and septic shock and others noting quick resolution with source control and antibiotic treatment. This is the first case report to our knowledge to report a CP empyema in a patient with lung malignancy. Given the comorbid lung malignancy, the patient’s presenting symptoms were mild with only mild shortness of breath, fevers, and generalized weakness despite the large CP empyema. Early antibiotics and source control with daily drainage of the pleural fluid allowed for successful management, circumventing a complex critical care course and successful management without ambulatory oxygen therapy on discharge.

**Key Words:** Clostridium, **Clostridium perfringens**, empyema

**INTRODUCTION**

**Clostridium perfringens** (CP) is a Gram-positive rod-shaped anaerobic organism that can be found naturally in human stool and the environment. It is classically associated with gas gangrene and necrotizing enteritis.¹,² Modes of clostridial infection include aspiration of oropharyngeal contents, invasive procedures to the chest cavity, and bacteremic seeding of the pleural cavity.³⁻⁵ While it has been hypothesized that underlying pulmonary conditions may predispose to rare CP pleuropulmonary infections, this is the 1⁴ case report to our knowledge in a patient with a known lung malignancy. In our patient, early initiation with broad-spectrum antibiotics and source control with daily drainage of the pleural fluid, allowed for successful management without the need for ambulatory oxygen therapy on discharge, ultimately controlled on oral antibiotics alone.

**CASE REPORT**

An 88-year-old man was brought in by his family with increasing fevers (self-measured to be 104F at home), generalized weakness, and mild shortness of breath. His medical history is notable for both squamous cell carcinoma of the lung, stage IV, status postexternal beam, and stereotactic body radiation therapy. Four months before presentation, he was found to have a left-sided malignant pleural effusion. He was readmitted 2 months later with reaccumulation of pleural fluid, and a PleurX Drainage catheter (Denver Biomedical, Inc., Cardinal Health, Inc.; Golden CO) was placed and the catheter drained by a visiting nurse every other day.

On presentation, he was febrile to 104F with mild hypoxia, 90s on 2 L. His heart rate was 140 beats/min and blood pressure 140/78 mmHg. On examination, he had notable dullness of percussion of the right side and crackles to auscultation. The skin overlying the PleurX catheter was dry, clean, and nonerythematous. There was no tenderness to the chest, costovertebral, or suprapubic areas.
His initial white blood cell was elevated at 22.04/mcL with hematocrit of 29.2%. His basic metabolic panel was notable for low sodium at 128, with bicarbonate of 25 mEq/L, and creatinine of 0.67 mg/dL. His chest X-ray revealed a large consolidation in the left lower lobe with moderate pleural effusion [Figure 1]. The right lung remained clear. The patient was started on vancomycin (1 g daily), and intravenous piperacillin-tazobactam 3.375 g q8 h and subsequently narrowed to ertapenem based on prior culture data.

Plans were made to drain the pleural fluid daily. Pleural fluid analysis showed a pH = 7.2, lactate dehydrogenase 5839 U/L (serum 236), and protein 3.1 g/dL (serum 5.0). A Gram-stain of this fluid revealed numerous segmented neutrophils and abundant Gram-positive rods [Figure 2a]. The color was red, and turbidity deemed cloudy. The volume of drainage was initially 600cc on day 1 and then ranged from 250 to 300 cc for subsequent days. By day 3 of admission, the pleural fluid became a light brown color. A computed tomography scan with and without contrast was done to identify a possible fistula for the source of infection [Figure 3]. While the scan was notable for numerous foci of gas within the pleural fluid consistent with a gas-producing organism, no visceral source for the possible infection could be found.

Our patient was discharged on day 5. He had been afebrile for 48 h with oxygen saturation ranging from 93% to 97% on room air with no associated shortness of breath or chest discomfort. He was continued on intravenous ertapenem 1 g daily with a peripherally-inserted central catheter with plans for a 2-week course followed by oral metronidazole 500 mg 3 times a day indefinitely. The anaerobic culture grew CP which was identified by convention biochemicals as well as by matrix-assisted laser desorption ionization-time of flight mass [Figure 2b].

**DISCUSSION**

CP pleuropulmonary infections are exceedingly rare although they have been documented in the medical literature since the early 1940s. The etiology of CP pleuropulmonary infections is not well understood. Risk factors include cirrhosis, chest trauma such as thoracentesis, pulmonary embolism, preexisting lung diseases, skin ulcers, and aspiration. For example, cirrhotic patients can develop hepatic hydrothorax in which the pleural fluid begins as transudative but evolves into infectious exudative effusions. Even without the evidence of trauma, such hydrothoraces have been observed to become infected, possibly from transient bacteremia. In other cases, colon instrumentation or colon cancer itself has been noted to pose risk to patients developing clostridial pleural effusions given that CP is an enteric commensal organism. While aspiration has been frequently cited as possible source given the relative anaerobic oral microbiome, CP is not known to commonly inhabit the oral cavity. In our patient, an underlying lung malignancy likely increased the risk of CP pleuropulmonary infection in that recurrent effusions required the need for a permanent PleurX catheter. Furthermore, the possibility of a further
immunocompromised state from prior chemotherapy and radiotherapy from squamous cell lung cancer exists as CP itself is an unusual organism to present in pleural fluid.

Early treatment with appropriate antibiotics such as penicillin or clindamycin is critical and important even after drainage of the empyema. The patient described in this case had a favorable outcome. He was treated early in the course of his diseases with ertapenem. Ertapenem is known to have broad anaerobic coverage. We have postulated that the etiology of the empyema in this patient was due to the permanent PleurX given the frequent drainage and long-term placement. Despite the large empyema, we decided the empyema was not an indication for the exchange of the PleurX catheter, especially given that the entry site in the chest wall was dry and nonerythematous. A likely transient bacterial seeding rather than permanent colonization of the tube was deemed likely.

**CONCLUSION**

We describe a rare case of CP empyema in a patient with metastatic squamous cell carcinoma of the lung with a favorable outcome after intravenous ertapenem treatment and daily drainage of the empyema through an existing PleurX catheter. Early detection and treatment through antibiotics and drainage are deemed critical for such an outcome especially in this setting where the patient presented with fevers and generalized weakness but initially only mild shortness of breath, unexpected in the setting of a large empyema which initially drained 600cc in an otherwise thin patient.

**Consent**

Informal verbal consent was obtained. All patient information has been de-identified to protect patient privacy.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understand that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

**REFERENCES**

1. Kaiser CW, Milgrom ML, Lynch JA. Distant nontraumatic clostridial myonecrosis and malignancy. Cancer 1986;57:885-9.
2. Schlapbach LJ, Ahrens O, Klimek P, Berger S, Kessler U. *Clostridium perfringens* and necrotizing enterocolitis. J Pediatr 2010;157:175.
3. Jackson S, Gregson DB, McFadden S, Laupland KB. *Clostridium perfringens* pleuropulmonary infection and septic shock: Case report and population-based laboratory surveillance study. Scand J Infect Dis 2003;35:883-6.
4. Corbett CE, Wall BM, Cohen M. Case report: Empyema with hydropneumothorax and bacteremia caused by *Clostridium sporogenes*. Am J Med Sci 1996;312:242-5.
5. Bashir Y, Benson MK. Necrotising pneumonia and empyema due to *Clostridium perfringens* complicating pulmonary embolus. Thorax 1990;45:72-3.
6. Albuquerque A, Macedo G. Spontaneous bacterial empyema in a cirrhotic patient due to *Clostridium perfringens*: Case report and review of the literature. Gastroenterol Hepatol 2013;36:69-71.
7. Streifler J, Pitlik S, Dux S, Garty M, Rosenfeld JB. Spontaneous bacterial pleuritis in a patient with cirrhosis. Respiration 1984;46:382-5.
8. Bentley DW, Lepper MH. Empyema caused by *Clostridium perfringens*. Am Rev Respir Dis 1969;100:706-10.