Case report

*Pasteurella multocida* pleural effusion: A case report and review of literature

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**A B S T R A C T**

We describe a man who developed pleural effusion with *Pasteurella multocida*, and review the reported literature concerning this entity. We identified 21 such cases, including our own. Most patients with *P. multocida* pleural effusions are immunocompromised and/or have significant co-morbidities. These effusions are typically complicated parapneumonic effusions that are grossly purulent (87%) with a low pleural fluid pH (mean 6.8), high protein (mean 4.8 g/dl) and high LDH (mean 1911 U/L) and low glucose (28.6 mg/dl). Pleural fluid drainage with tube thoracostomy was required in the majority (62%) of cases. © 2016 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

1. Introduction

*Pasteurella multocida* (*P. multocida*) empyema is a rare clinical entity. We describe a patient with *P. multocida* empyema, as well as analyze all the available reports previously published in the medical literature. We describe the clinical and pleural fluid characteristics of these cases.

2. Methods

We performed a PubMed search for *P. multocida* empyema using keywords ‘*Pasteurella multocida*’, ‘empyema’ and ‘pleural effusion’. We identified 20 case reports in addition to our own and present their pleural fluid findings in Tables 1 and 2. The mean and standard deviation (for quantitative variables) are also presented. Findings of pleural fluid analysis are reported in conventional units wherever possible.

2.1. Case report

A 75-year-old man was hospitalized for 3 weeks of progressive shortness of breath. He had a history of an ischemic cardiomyopathy and valvular heart disease, and had undergone coronary artery bypass grafting, aortic and mitral valve repair. He also had hypertension, atrial fibrillation and had not been anticoagulated because of gastrointestinal bleeding. He had end stage renal disease presumed secondary to hypertension and had required renal replacement therapy for the last 3 years. He was a former smoker of 70 pack-years and had a pet dog.

Physical examination at the time of transfer to medical ICU showed that he was in mild respiratory distress with temperature 38.2 °C, respiratory rate of 18/min, blood pressure 95/54 mmHg, irregularly irregular pulse 101/min and oxygen saturation 94% on 3 L/min supplemental oxygen. Lung auscultation revealed decreased breath sounds with dullness to percussion at the posterior left base.

Laboratory data included: white blood cell count 16,100 cells/μl, hemoglobin 9.4 mg/dl, platelet count 152,000/μl. A chest radiograph showed a large left pleural effusion. Bedside ultrasonography revealed a homogeneously echogenic pleural effusion. A small-bore chest tube was introduced under ultrasound guidance. Purulent fluid was aspirated.

Pleural fluid analysis showed: pH 7.04, glucose < 5 mg/dl, protein 3.3 g/mL, LDH 1535 U/L, WBC 45,160/μl with 99% neutrophils, RBC 12,000/cumm. Pleural fluid Gram stain was negative. Piperacillin/tazobactam and linezolid were initiated.

*P. multocida* was detected on pleural fluid culture within 24 hours that was resistant to ampicillin but sensitive to amoxicillin/clavulanate. Linezolid was discontinued. Intra-pleural tPA and DNase were instilled through the chest tube that resulted in evacuation of the space (total fluid drained = 1.6L) with a residual...
pneumothorax suggestive of lung entrapment (trapped lung physiology). His dyspnea improved and he was transferred to the general medical ward. His fever resolved; oxygenation and leukocytosis continued to improve. However, the patient developed massive gastrointestinal bleeding resulting in cardio-respiratory arrest leading to death.

3. Discussion

We report the case of an elderly man with *P. multocida* empyema. He received timely and aggressive antibiotic therapy and complete drainage of the pleural space. Although therapy resulted in clinical improvement; he died from gastrointestinal bleeding and cardiac problems.

*P. multocida* is a gram negative encapsulated non-motile cocobacillus. It forms part of the normal flora in the oropharynx and nasopharynx but can also be a pathogen [21]. Animal exposure; usually from the scratch, bite or lick of a domestic cat or dog, is an important risk factor and is present in most cases of Pasteurella infection [21,22].

Infection due to *P. multocida* is usually limited to the skin and soft tissue with regional complications [23]. *P. multocida* infection of the respiratory tract is uncommon, as is pleural infection that has been described in isolated case reports [22]. We identified 21

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**Table 1**

Clinical characteristics and outcomes.

| Reference number | Age (years) | Sex | Side of pleural effusion | Significant comorbidities | Chest tube | Outcome |
|------------------|-------------|-----|--------------------------|---------------------------|------------|---------|
| [1]              | 63          | M   | Left                     | None known                | Yes        | Death   |
| [2]              | 8           | F   | Right                    | Noonan syndrome           | Yes        | Survived |
| [3]              | 57          | F   | Bilateral                | CHF                       | Yes        | Survived |
| [4]              | 64          | F   | Left                     | Liver cirrhosis           | Yes        | Survived |
| [5]              | 86          | F   | Left                     | None known                | No         | Survived |
| [6]              | 69          | F   | Right                    | Liver cirrhosis           | Yes        | Death   |
| [7]              | 54          | F   | Left                     | COPD                      | Yes        | Survived |
| [8]              | 60          | M   | Right                    | None known                | No         | Death   |
| [9]              | 57          | F   | Left                     | Liver cirrhosis, asplenia | Yes        | Death   |
| [10]             | 85          | F   | Bilateral                | None known                | Yes        | Survived |
| [11]             | 65          | F   | Right                    | RA on steroids and methotrexate | Yes     | Survived |
| [12]             | 88          | M   | Right                    | None known                | Yes        | Death   |
| [13]             | 90          | M   | Right                    | None known                | No         | Survived |
| [14]             | 76          | M   | Right                    | Prostate CA, PVD, smoking | Yes        | Survived |
| [15]             | 76          | F   | Right                    | None known                | No         | Death   |
| [16]             | 77          | M   | Right                    | None known                | No         | Survived |
| [17]             | 51          | M   | Right                    | Bronchiectasis and BPF    | No         | Survived |
| [18]             | 72          | F   | Right                    | Chronic bronchitis        | No         | NR      |
| [19]             | 75          | M   | Bilateral                | None known                | No         | Death   |
| [20]             | 67          | F   | Right                    | Liver cirrhosis and CHF   | Yes        | Death   |
| Present Case     | 75          | M   | Left                     | ESRD, valvular/coronary disease | Yes     | Death   |
| Mean             | 67 (±17.7)  | 40% M, 60% F | 57% Right, 29% Left, 14% Bilateral | 57% Present, 43% None known | 62% Chest tube placed | 45% Death |

F = Female, M = Male, CHF = congestive heart failure, COPD = chronic obstructive pulmonary disease, RA = rheumatoid arthritis, CA = cancer, PVD = peripheral vascular disease, BPF = bronchopleural fistula, ESRD = end stage renal disease, NR = not reported.

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**Table 2**

Summary of pleural fluid analysis.

| Reference number | Appearance | pH | Total protein G/DL | LDH (U/L) | Glucose Mg/DL | WBC count | PMN % |
|------------------|------------|----|--------------------|-----------|---------------|-----------|-------|
| 1                | Purulent   | NR | NR                 | NR        | NR            | NR        | NR    |
| 2                | Chylous    | NR | 8.8                | NR        | NR            | 8014      | 89    |
| 3                | Purulent   | NR | 12.6               | 1590      | 3             | 10,500    | 98    |
| 4                | Serosanguinous | 3.2 | NR                      | NR        | 100           | 19,150    | 91    |
| 5                | Purulent   | 6.53 | 5.6                   | 403       | 4             | 7000      | 96    |
| 6                | Purulent   | 6.09 | 3                    | NR        | 5.4           | 10,500    | 98    |
| 7                | NR         | 6.9 | NR                  | NR        | 12            | 5140      | NR    |
| 8                | NR         | NR  | NR                  | NR        | NR            | NR        | NR    |
| 9                | Purulent   | 6.8 | 4.9                 | NR        | 1.44          | 160       | 60    |
| 10               | NR         | 7.23 | 4.3                       | 4209      | 44           | 13,900    | 43    |
| 11               | NR         | 4.2 | NR                  | 69        | 74,888        | 84        |
| 12               | Purulent   | 0.004 | 3.4                     | 1676      | 59           | 17,100    | 95    |
| 13               | Purulent   | 6.6 | 3.4                 | 2052      | 11.7         | 1800      | 88    |
| 14               | Purulent   | NR  | NR                  | NR        | NR            | NR        | NR    |
| 15               | Purulent   | NR  | NR                  | NR        | NR            | NR        | NR    |
| 16               | Purulent   | NR  | NR                  | NR        | NR            | NR        | NR    |
| 17               | Purulent   | NR  | NR                  | NR        | NR            | NR        | NR    |
| 18               | NR         | NR  | NR                  | NR        | NR            | NR        | NR    |
| 19               | NR         | NR  | NR                  | NR        | NR            | NR        | NR    |
| 20               | Purulent   | NR  | NR                  | NR        | NR            | NR        | NR    |
| Present Case     | Purulent   | 7.04 | 3.3                      | 1535      | <5          | 45,160    | 99    |
| Mean             | 87% Purulent | 6.8 ± 0.2     | 4.8 ± 3.3                      | 1913 ± 1255 | 29 ± 14    | 17,776 ± 21,472 | 86 ± 18 |

LDH: lactate dehydrogenase; PMN = polymorphonuclear leukocytes; WBC: white blood cell; NR = not reported.

a Pleural fluid WBC count reported in several different units among these references; we therefore displayed the pleural WBC counts in units consistent with the peripheral WBC count in each reference.
b LDH was elevated but could not be converted to conventional units.
c ±standard deviation, if applicable.
published reports, including our own, of *P. multocida* infected pleural effusions. In Table 1; we describe the clinical characteristics and outcome of these cases. Table 1 suggests that most patients with *P. multocida* pleural infection have underlying cardiopulmonary disease and/or are immunocompromised (12/21, 57%) and majority of patients had exposure to animals (15/21, 71%). Pleural drainage is often required (13/21, 62%) and the condition carries a high mortality (9/20, 45%).

Table 2 displays the available pleural fluid characteristics of these patients. The effusions are predominantly complicated parapneumonic effusions with 87% (13/15) described as purulent, and the following pleural fluid findings: very low pH (mean 6.8), high protein (mean 4.8 g/dl), high LDH (mean 1911 U/L) and a very low glucose concentration (mean 28.6 mg/dl). The mean pleural WBC count in the reported cases was 17,776 and there was a predominance of polymorphonuclear leukocytes in the large majority of the cases (mean 86%, 10/11 cases > 50%). Pleural fluid culture was positive in 90% of reported cases (18/20).

Our case report and literature review highlight that *P. multocida* may cause significant pleural disease. Pleural fluid findings typically reveal a complicated parapneumonic pleural effusion that often requires drainage. Pleural infection with *P. multocida* is often fatal, which may reflect the severity of infection or the moribund state of the patients who develop this infection.

**Conflict of interest**

SNJ, RS, AC: None.

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