Case Report

**Streptococcus intermedius Causing Necrotizing Pneumonia in an Immune Competent Female: A Case Report and Literature Review**

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We report a case of a 52-year-old immunocompetent Caucasian female treated for necrotizing *Streptococcus intermedius* pneumonia and review available literature of similar cases. Our patient presented with respiratory failure and required hospitalization and treatment in the intensive care unit. Moreover, she required surgical drainage of right lung empyema as well as decortication and resection. The review of literature revealed three cases of *S. intermedius* pneumonia, one of which was a mortality. Comparison of the published cases showed a highly varied prehospital course and radiological presentations, with a symptomatic phase ranging from 10 days to five months. Radiological findings varied from an isolated pleural effusion to systemic disease with the presence of brain abscesses. Immunocompetence appears to correlate well with the overall prognosis. In addition, smoking appears to be an important risk factor for *S. intermedius* pneumonia. In 2 (50%) of cases, pleural fluid analysis identified *S. intermedius*. In contrast, no organism was found in our patient, necessitating the acquisition of lung tissue sample for the diagnosis. In conclusion, both medical and surgical management are necessary for effective treatment of *S. intermedius* pneumonia. The outcome of treatment is good in immunocompetent individuals.

1. Introduction

*Streptococcus intermedius* is part of the *Streptococcus anginosus* subgroup (formerly *Streptococcus milleri*) [1–4]. It is a Gram-positive, catalase negative coccus that is nonmotile and is a facultative anaerobe [5]. They are normally found as part of the oral cavity and the gastrointestinal tract [4, 6, 7]. Although bacteria of the *S. anginosus* group are known to cause abscesses and systemic infections, *S. intermedius* pneumonia is rare and there are very few reported cases. We report an interesting case of necrotizing pneumonia in an immunocompetent patient caused by *S. intermedius* and we also review published cases in the reported literature.

2. Case Summary

A 52-year-old immunocompetent Caucasian female with a past medical history of asthma, that is only treated with albuterol rescue inhaler, and who is also an ex-smoker was transferred from the urgent care clinic to the emergency department (ED). She presented with shortness of breath with minimal activity and low oxygen saturation. Her prior symptoms were coughing and sputum production (greenish, thick, and nonbloody) for 6 weeks. She had been treated for community acquired pneumonia as an outpatient by her primary care physician and in an urgent care clinic. She was initially treated with oral erythromycin for a week. Two weeks following that, she received a week’s course of ciprofloxacin. Her symptoms, however, failed to improve.

Her vitals at presentation were temperature: 99.8°F, HR: 130 BPM, BP: 113/59 mmHg, RR: 36, and SpO2: 84% on room air. She was in severe respiratory distress and unable to complete a sentence without pausing or coughing. Lung exam findings included diminished breath sounds on the right lung base and rhonchi and crackles throughout both lungs on auscultation. ABGs showed pH 7.32, pCO₂ 33, and pO₂ 69 on 36% FiO₂. The blood test results can be seen in Table 1, most significant of which is the leukocytosis. The extent of the pneumatic process is demonstrated in the images presented in Figure 1.
Figure 1: Chest X-ray (a) shows bilateral multilobar lung infiltrate with the appearance of loculated right pleural effusion. CT scan of the chest shows patchy airway disease throughout the upper lung lobes (b) as well as lower lung lobes (c).

| Table 1: Blood test results. |
|-----------------------------|
| Glu  | 108| mg/dL |
| Na   | 142| mEq/L |
| K    | 3.0| mEq/L |
| Cl   | 108| mEq/L |
| HCO₃⁻ | 14.5| mEq/L |
| AG   | 19.5| |
| BUN  | 27.0| mg/dL |
| Cr   | 1.1| mg/dL |
| GFR  | 52| |
| Lactate | 1.9| mmol/L |
| WBC  | 29.2| 10⁹/μL |
| Neu  | 95| % |
| Lym  | 3.5| % |
| Mon  | 1.3| % |
| Eos  | 0.2| % |
| Hgb  | 11.4| g/dL |
| Plt  | 428| 10⁹/μL |

AG: anion gap and GFR: glomerular filtration rate.

The patient was transferred to the intensive care unit and started empirically on aztreonam, vancomycin, and azithromycin with high flow oxygen. The patient’s blood cultures, fungal cultures, legionella antigen and pleural fluid Gram staining, acid fast staining, and culture were all negative. Decortication, resection of the right upper lung lobe, and drainage of the empyema were performed on the third day of hospitalization and a chest tube was inserted.

Histology of the lung tissue sample showed acute and chronic pneumonitis with large areas of organization, focal abscess formation, and palisaded necrotizing granulomata. Special staining did not show any organisms. Culture of the tissue sample did grow *Streptococcus intermedius*, however. The organism was penicillin sensitive, but the patient has penicillin allergy. She was therefore given IV ceftriaxone, since beta-lactams have higher efficacy against streptococci than vancomycin. The patient was treated for a total of 14 days in hospital with IV antibiotics, of which, 7 days were in the intensive care unit.

3. Discussion

A search through PubMed and Google Scholar yielded only three reported cases of pneumonia caused by *S. intermedius*. All of the published cases are of male patients. 2 (67%) of the published cases are for patients in their 50s. Our case appears to be the only female patient. The immunocompetence of two of the reported cases is not mentioned. One case states the patient denies having risk factors for HIV [10]. Alcoholic liver cirrhosis is noted to be one of the conditions in one of the patients [9], which is a predisposing factor to infection as it
Table 2: Published cases of *Streptococcus intermedius* data.

| Case | Our case | 1 [8] | 2 [9] | 3 [10] |
|------|----------|-------|-------|--------|
| Age  | 52       | 79    | 55    | 52     |
| Gender | F    | M     | M     | M      |
| Radiological diagnosis | Bilateral pneumonia, loculated right pleural effusion | Left upper lobe pneumonia and left pleural empyema | Right upper lobe pneumonia, bilateral brain abscesses | Loculated left pleural effusion |
| Duration of respiratory symptoms | 6 weeks | — | 10 days | 5 months |
| Past medical history | Asthma | Surgical drainage of right empyema 4 months prior | Alcoholic liver cirrhosis | Hypertension, hyperlipidemia, and poor dental hygiene |
| Smoker status | Ex-smoker | Ex-smoker | — | Active smoker |
| Systolic blood pressure (mmHg) | 113 | 104 | — | 125 |
| Heart rate | 110 | 118 | — | 93 |
| Respiratory rate | 36 | — | — | — |
| Oxygen saturations | 84% on room air | 93% on 3 L | — | — |
| Temperature | 99.8°F (37.7°C) | 101.1°F (38.4°C) | 101.3°F (38.5°C) | 98.0°F (36.7°C) |
| Initial WBC | 29.2 | 39.6 | — | Normal (no number given) |
| Initial empiric antibiotics | Aztreonam, vancomycin + azithromycin | Meropenem | Ceftriaxone + ampicillin | Levofloxacin + clindamycin |
| Targeted antibiotics | Ceftriaxone | Meropenem | — | Levofloxacin |
| Total duration of antibiotics | 14 days | 14 days | — | 24 |
| Surgical intervention | Decortication, resection of right upper lung lobe and chest tube insertion | Left pleurectomy and chest tube insertion | Video-assisted thoracoscopic biopsy | Thoracocentesis and chest tube insertion |
| Outcome | Survived | Survived | Died | Survived |

Treatment duration with antibiotics in our case and in one of the reported cases was 14 days, though in another it was 24 days [10]. *S. intermedius* appears to be sensitive to beta-lactam antibiotics, though some cases of resistance have been reported [13]. In penicillin allergic patients, vancomycin is suggested as an alternative [14]. All the patients had a form of procedural intervention performed. This is expected as 3 (75%) of the patients had empyema with some form of loculation that necessitated drainage. Only one (25%) of the patients in the reported cases died from the pneumonia. This may be attributable to the concomitant presence of brain abscesses and liver cirrhosis [9].

As presented in Table 3, all of the cases that had a pleural fluid sample from the patient show it to be an exudate as LDH is >1000, meeting Light’s criteria as well as the two-test and three-test rules [15, 16]. In both cases 1 and 3, organisms were identified in pleural fluid culture. In case 1, *S. intermedius* was identified following PCR and a homology search on the culture of the pleural fluid. In contrast, no organisms were identified in either pleural fluid microscopy or culture from the sample taken from our patient. The diagnosis was
in instead not made by lung tissue sample culture. This shows that even when no organism is identified in the pleural fluid, *S. intermedius* can still be the etiologic agent. In both case 2 and in our case, histology of the lung tissue revealed necrotizing pneumonia, signifying the severity of disease caused by this organism (refer to Table 3).

### 4. Conclusion

To sum up, *Streptococcus intermedius* pneumonia has a wide-ranging prehospital incubation period, presentation, and radiological findings. Nonetheless, it is clear from both our case and the reported cases that *S. intermedius* causes severe disease that requires medical as well as surgical management to be treated effectively. Moreover, if pleural fluid microscopy and culture are negative, efforts should be made to obtain a lung tissue sample for microscopy and culture to identify the bacterium. Despite the severity of the disease, *S. intermedius* pneumonia shows good sensitivity to broad-spectrum antibiotics such as beta-lactams. As a result, patients have a good prognosis provided that they are immunocompetent.

### Competing Interests

The authors declare no competing interests.

### Authors’ Contributions

Faris Hannoodi was the main author, drafted most of the manuscript, and reviewed published literature, Israa Ali helped in drafting manuscript, Hussam Sabbagh helped in drafting manuscript, and Sarwan Kumar helped in drafting manuscript and revised its material. All authors read and approved the final manuscript.

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### Table 3: Published cases of *Streptococcus intermedius* pleural fluid and tissue analysis.

| Case | Our case | 1 [8] | 2 [9] | 3 [10] |
|------|----------|------|------|-------|
| Total protein (g/dL) | 4.0 | 4.3 | — | 4.2 |
| LDH | 1372 | 2873 | — | 6280 |
| Glucose (mg/dL) | 93 | 1.0 | — | 10 |
| Gram staining | No organisms | No organisms | — | — |
| Pleural fluid culture | No growth | S. anginosus group | — | S. intermedius |
| Tissue histology | Necrotizing pneumonia, culture: S. intermedius | — | Necrotizing pneumonia, culture: S. intermedius | — |

Case 2 did not have a pleural fluid sample; *S. anginosus*: *Streptococcus anginosus*.
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