

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

# Respiratory Medicine Case Reports

journal homepage: [www.elsevier.com/locate/rmcr](http://www.elsevier.com/locate/rmcr)

## Case report

# A challenging case of thoracic empyema caused by *Prevotella* spp

Rémi Diesler<sup>\*</sup>, Lize Kiakouama-Maleka

Service de Pneumologie, Hôpital de la Croix-Rousse, Hospices Civils de Lyon, 103 Grande Rue de la Croix-Rousse, 69004, Lyon, France

## ARTICLE INFO

### Keywords:

Thoracic empyema  
*Prevotella*  
 16S ribosomal DNA  
 Lung nodules

## ABSTRACT

We report here the case of a 49-year-old man admitted for a diagnostic work-up of bilateral lung nodules. Empyema rapidly developed after a chest computed-tomodensitometry guided lung puncture. Despite the lack of obvious aetiology after two biopsies, the diagnosis was reached by performing 16S ribosomal DNA (rDNA) sequence analysis, which identified *Prevotella* spp in the pleural liquid. The empyema and lung nodules resolved after appropriate antibiotic therapy.

## 1. Introduction

*Prevotella* strains are Gram-negative, rod-shaped anaerobes, individualized in 1990 from the *Bacteroides* genus [1]. They are classically considered commensal bacteria, several species being extensively present in the human microbiota [2,3]. However, certain species have been isolated in various infections: brain abscesses [4], intra-abdominal infections [5], dental infections [6], and empyema [7]. Empyema is defined by the presence of pus in the pleural space. It can be a complication of pneumonia, chest trauma, or invasive thoracic procedures and surgery [8]. The incidence of empyema is increasing in children [9] and remains an important cause of morbidity and mortality worldwide. The identification of the causal agent is important but not always possible, and broad-spectrum antibiotic therapy is often required [10]. We report here the case of a community-acquired *Prevotella* infection with bilateral pulmonary abscesses and empyema in a middle-aged immunocompetent man.

## 2. Case presentation

A 49-year-old man was referred to our pneumology ward for diagnostic work-up and treatment of bilateral excavated pulmonary nodules. He suffered from repeated spinal disc herniations, had an ancient episode of dengue fever, and had a fifty pack-year smoking history. The patient presented to his attending physician with a 1-month history of asthenia, fever, weight loss (8 kg), and dyspnoea. Two courses of antibiotics (amoxicillin followed by pristinamycin) provided no improvement, and the patient underwent a chest computed-tomodensitometry (CT) scan, which showed moderate emphysema and multiple peripheral bilateral pulmonary nodules, some of which were excavated (Fig. 1A–C).

The patient was admitted to a local hospital. The physical examination revealed fine pulmonary crackles upon auscultation, with bilateral symmetrical vesicular breathing. The white blood cell (WBC) count was  $12.6 \times 10^9/L$  with 81% neutrophils and the C-reactive protein (CRP) level was 87.5 mg/L. Blood cultures and urinary antigen testing for *S. pneumonia* and *L. pneumophila* were negative.

The initial diagnostic work-up included a bronchoscopy showing no endobronchial abnormality. The bronchoalveolar lavage (BAL) found only oropharyngeal flora, and acridine orange fluorescent staining detected no acid-alcohol-resistant bacteria. A transthoracic echocardiography showed no evidence of infectious endocarditis. The patient's serum tested negative for anti-neutrophil cytoplasmic

<sup>\*</sup> Corresponding author.

E-mail address: [remi.diesler@chu-lyon.fr](mailto:remi.diesler@chu-lyon.fr) (R. Diesler).

<https://doi.org/10.1016/j.rmcr.2021.101567>

Received 11 July 2021; Received in revised form 21 October 2021; Accepted 12 December 2021

Available online 15 December 2021

2213-0071/© 2021 Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license

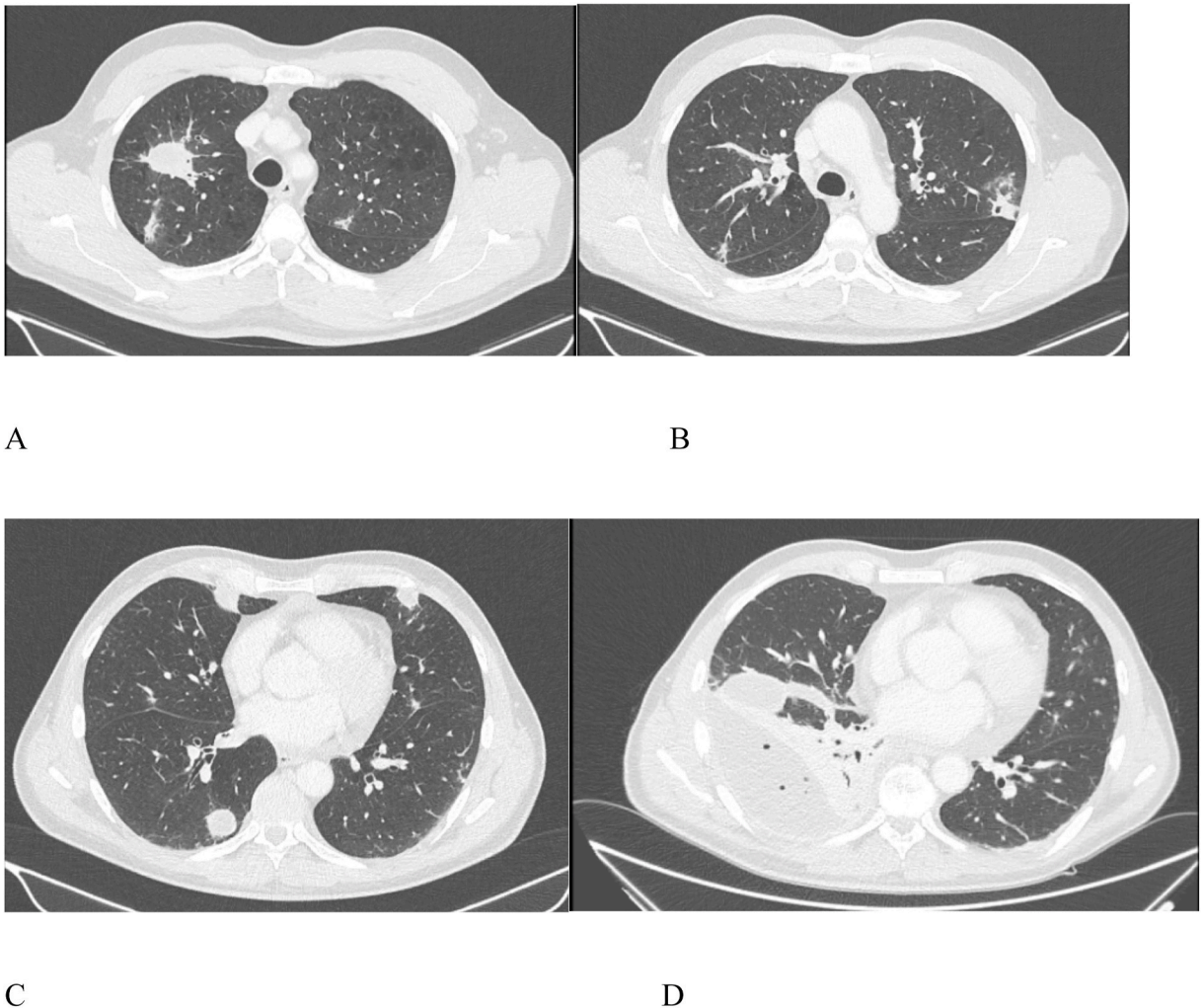
(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

antibody (ANCA) and antinuclear antibodies. Eventually, a transthoracic CT-guided puncture of a right lower lobe nodule was performed, and the results showed fibrous and inflammatory tissue remodelling as well as altered neutrophils, with no evidence of malignancy. Another chest CT-scan for acute chest pain and intensifying dyspnoea after the puncture revealed new right pleural effusion. During his stay, the patient received an empirical dose of ceftriaxone with gentamicin, which was switched to amoxicillin-clavulanate plus ofloxacin after the puncture.

The patient was then referred to our ward for diagnosis and treatment in a tertiary care centre. Upon admission, the patient had fever and reduced vesicular breathing on the right side of the chest. The WBC count was  $21.6 \times 10^9/L$  (83% neutrophils) and the CRP level was 318 mg/L. Antinuclear antibodies, anti-extractable nuclear antigen (ENA) antibodies, rheumatoid factor, ANCA, and *Aspergillus fumigatus*-specific IgE were negative. *Brucella*, *Coxiella*, *Bartonella*, and *Rickettsia* serology was also negative. Thoracentesis was performed and retrieved straw-coloured liquid, the aerobic and anaerobic cultures of which yielded no growth.

Bronchoscopy and BAL were performed again without reaching a microbiological diagnosis. No acid-alcohol-resistant bacteria were found on bronchoscopy aspiration, BAL, sputum, or thoracentesis liquid, and cultures were negative for *Mycobacterium tuberculosis* and fungi. Control chest CT-scan detected bullae in the pleural effusion with pleurae hyperenhancement consistent with the diagnosis of pleural empyema (Fig. 1D). The nodules showed little regression compared to the first scan. The patient was referred to the thoracic surgical team and a chest tube was inserted before the patient underwent a video-assisted thoracoscopic surgery (VATS) for the complete cleaning of the infection. The visceral pleurae sample from the surgery showed inflammation of the pleurae and false membranes with no sign of malignancy. 16S ribosomal DNA (rDNA) sequence analysis was performed on the pleural liquid and identified *Prevotella* spp, despite the Gram stain examination being negative.

Antibiotic therapy by amoxicillin-clavulanate and ofloxacin was administered for seven days before switching to amoxicillin-clavulanate alone in light of the findings from the rDNA sequencing.



**Fig. 1.** Patient's chest computed-tomodensitometry (CT), axial cuts. A-C shows bilateral centimetric peripheral nodules, some of which are excavated. D right pleural effusion with pleural hyperenhancement and bullae consistent with pleural empyema diagnosis.

The 6-week follow-up assessment showed full clinical and radiological recovery.

### 3. Discussion

Anaerobes are frequently involved in pleural infections, representing up to 20% of microbiological diagnoses [11]. Among them, *Prevotella* has been reported to seldom be the causal agent of empyema [12]. Diagnosis of an intrathoracic *Prevotella* infection is classically challenging. The bacterial culture yield from pleural fluid is low using routine methods [11,13], and 16S ribosomal DNA sequence analysis is not always available. The clinical course of anaerobe-caused empyema is often insidious due to the presence of systemic symptoms (fatigue, weight loss) [8]. In this particular case, the clinical presentation was severe and the diagnosis was difficult. The initial radiological presentation of excavated nodules was misleading, and the absence of bacteriological identification led the physicians to perform two transthoracic CT-guided punctures in the search for a malignant aetiology. The use of DNA sequencing, a technique validated for detecting the causal agent in such infections [14–18], finally allowed a delayed diagnosis by identifying *Prevotella* spp in the pleural fluid.

### 4. Conclusion

Bacteriological diagnosis is required in pleural infections but is often difficult, especially in the case of anaerobes. Molecular assays are helpful in cases where the causal agent remains unknown and can prevent repeating invasive diagnostic procedures.

### Declaration of competing interest

Rémi Diesler has received financing for congress including travel and hotel fees from Laidet Medical and Vitalaire.

### References

- [1] H.N. Shah, D.M. Collins, *Prevotella*, a new genus to include *Bacteroides melaninogenicus* and related species formerly classified in the genus *Bacteroides*, *Int J Syst Bacteriol* 40 (2) (1990) 205–208, avr.
- [2] M. Hilty, C. Burke, H. Pedro, P. Cardenas, A. Bush, C. Bossley, et al., Disordered microbial communities in asthmatic airways, *PLoS One* 5 (1) (2010), e8578, 5 janv.
- [3] M. Arumugam, J. Raes, E. Pelletier, D. Le Paslier, T. Yamada, D.R. Mende, et al., Enterotypes of the human gut microbiome, *Nature* 473 (7346) (2011) 174–180, 12 mai.
- [4] T. Hoshino, A. Nakamura, [Clinical and bacteriological features of six cases with intracranial abscess in childhood], *Kansenshogaku Zasshi* 76 (2) (2002) 83–88, févr.
- [5] E. Nagy, Anaerobic infections: update on treatment considerations, *Drugs* 70 (7) (2010) 841–858, 7 mai.
- [6] S. Dumitriu, G. Băncescu, A. Murea, N. Skaug, Isolation and speciation of *Prevotella* strains from periodontal abscesses, *Roum Arch Microbiol Immunol* 57 (1) (1998) 5–10, mars.
- [7] I. Brook, E.H. Frazier, Aerobic and anaerobic microbiology of empyema. A retrospective review in two military hospitals, *Chest* 103 (5) (1993) 1502–1507, mai.
- [8] Brims FJH, Lansley SM, Waterer GW, Lee YCG. Empyema thoracis: new insights into an old disease. *Eur. Respir. Rev.* 1 sept 2010;19(117):220-228.
- [9] D.J. Hendrickson, D.A. Blumberg, J.P. Joad, S. Jhavar, R.J. McDonald, Five-fold increase in pediatric parapneumonic empyema since introduction of pneumococcal conjugate vaccine, *Pediatr Infect Dis J* 27 (11) (nov 2008) 1030–1032.
- [10] K.R. Shen, A. Bribiesco, T. Crabtree, C. Denlinger, J. Eby, P. Eiken, et al., The American Association for Thoracic Surgery consensus guidelines for the management of empyema, *J. Thorac. Cardiovasc. Surg.* 153 (6) (2017), e129-46.
- [11] N.A. Maskell, S. Batt, E.L. Hedley, C.W.H. Davies, S.H. Gillespie, R.J.O. Davies, The bacteriology of pleural infection by genetic and standard methods and its mortality significance, *Am. J. Respir. Crit. Care Med.* 174 (7) (1 oct 2006) 817–823.
- [12] A. Di Marco Berardino, R. Inchingolo, A. Smargiassi, A. Re, R. Torelli, B. Fiori, et al., Empyema caused by *Prevotella bivia* complicating an unusual case of spontaneous chylothorax, *J Clin Microbiol* 52 (4) (2014) 1284–1286, avr.
- [13] F. Farjah, R.G. Symons, B. Krishnadasan, D.E. Wood, D.R. Flum, Management of pleural space infections: a population-based analysis, *J Thorac Cardiovasc Surg* 133 (2) (2007) 346–351, févr.
- [14] H. Zhou, Y. Shen, Q. Shen, J. Zhou, Thoracic empyema caused by *Prevotella* spp. diagnosed using 16S rDNA sequence analysis, *Clin Respir J* 9 (1) (2015) 121–124, janv.
- [15] S. Saglani, K.A. Harris, C. Wallis, J.C. Hartley, Empyema: the use of broad range 16S rDNA PCR for pathogen detection, *Arch Dis Child* 90 (1) (2005) 70–73, janv.
- [16] D. Tarragó, A. Fenoll, D. Sánchez-Tatay, L.A. Arroyo, C. Muñoz-Almagro, C. Esteva, et al., Identification of pneumococcal serotypes from culture-negative clinical specimens by novel real-time PCR, *Clin Microbiol Infect Off Publ Eur Soc Clin Microbiol Infect Dis* 14 (9) (sept 2008) 828–834.
- [17] A.J. Blaschke, C. Heyrend, C.L. Byington, I. Obando, I. Vazquez-Barba, E.H. Doby, et al., Molecular analysis improves pathogen identification and epidemiologic study of pediatric parapneumonic empyema, *Pediatr Infect Dis J* 30 (4) (2011) 289–294, avr.
- [18] R. Prasad, C. Kumari, B.K. Das, G. Nath, Nested polymerase chain reaction (PCR) targeting 16S rDNA for bacterial identification in empyema, *Paediatr Int Child Health* 34 (2) (2014) 125–127, mai.