Prevotella bivia empyema complicating an unusual case of spontaneous chylothorax

Alessandro Di Marco Berardino1*, Riccardo Inchingolo1*, Andrea Smargiassi1, Antonina Re1,
Riccardo Torelli2, Barbara Fiori2, Tiziana d’Inzeo2, Giuseppe Maria Corbo1, Salvatore Valente1,
Maurizio Sanguinetti2 and Teresa Spanu2.

1: Pulmonary Medicine Dept., Policlinico Universitario “A. Gemelli”, Università Cattolica del
Sacro Cuore, Roma, Italy.
2: Institute of Microbiology, Policlinico Universitario “A. Gemelli”, Università Cattolica del Sacro
Cuore, Roma, Italy.

*: Both authors equally contributed to this work.

Corresponding author: Riccardo Inchingolo

Mailing address: Pulmonary Medicine Department, Catholic University of Sacred Heart, Largo
Gemelli 8, 00168 Rome, Italy. Phone: 39 06 30154236. Fax: 39 06 30154304; e-mail:
r_inchingolo@virgilio.it

Key words: Prevotella bivia, chylothorax, empyema, pleural effusion.
Abstract

Spontaneous chylothorax is rare in adults. We present an unusual case that was complicated by *Prevotella bivia* empyema. Full recovery was achieved with chest-tube drainage and prompt treatment with intravenous clindamycin.

Case report

A 78-year-old man was admitted to the hospital with a 1-month history of weight loss (10 kg), asthenia, dyspnea, dry cough, right chest pain, and low-grade fever (37.1°C on admission). He was an ex-smoker (60 packs/year) with moderately severe chronic obstructive pulmonary disease that was not associated with chronic respiratory failure. He also suffered from chronic periodontitis, was known to harbor the factor V Leiden mutation, and had been treated 3 months earlier for an episode of pulmonary microembolism. The physical examination revealed diminished chest expansion, tachypnea (24 breaths/min), reduced vesicular breathing on the right, and bilateral rales. The white blood cell (WBC) count was $14.8 \times 10^9$/liter with 94% neutrophils. Arterial blood gas analysis on room air revealed severe hypoxemia compensated respiratory acidosis. A chest X-ray showed a right pleural effusion without clear evidence of consolidation (Figure 1a). Ultrasound disclosed two loculated pleural effusions in the right hemithorax. Computed tomography (CT) revealed two large right pleural effusions (anterior, lateral), a small posterior effusion, right middle lobe consolidation, and diffuse, bilateral “ground-glass” opacities (Figure 1b). Empirical treatment with intravenous levofloxacin (750 mg q24h) was started, and a chest tube was inserted on the right mid-axillary line. A 50-mL sample of purulent fluid was characterized by a pH of 6.8, lactate dehydrogenase (LDH) level of 1320 IU/liter, WBC count of 10,840 cells/μl (96% neutrophils), high triglyceride levels (270 mg/dl vs serum level of 67 mg/dL), low cholesterol level (10 mg/dl), and no identifiable cholesterol crystals. Microscopic examination of the fluid showed numerous neutrophils.
but no parasites or ova (1, 2, 3, 4). Gram staining revealed short rod-shaped bacteria, and cytology was negative for malignancy. Ziehl-Nielsen stain detected no acid alcohol-resistant bacteria. A diagnosis of chylothorax with pleural infection was made. Two other chest tubes were inserted and drainage samples from each were sent to the microbiology laboratory. In accordance with our routine protocol, the pleural fluid specimens were subjected to aerobic cultures on MacConkey (35°C) and Sabourad (30°C) agars; microaerobic cultures (35°C in air with 5% CO₂); anaerobic cultures in an anaerobic growth chamber (Forma Scientific, Marietta, OH) containing 10% v/v hydrogen, 10% carbon dioxide, and 80% nitrogen on Brucella blood, Columbia, and Schaedler agars (35°C); and aerobic and anaerobic cultures on enriched thioglycolate medium with vitamin K and haemin (plates and slants from Becton Dickinson Diagnostic Systems, Sparks, MD, and bioMérieux, Marcy-L’Etoile, France). Specimens were also inoculated onto Lowenstein-Jensen solid medium and in MGIT liquid medium (Becton Dickinson). Three sets of blood cultures (Becton Dickinson) were drawn. Lymphatic scintigraphy with ⁹⁹ᵐTc-human albumin revealed no possible sources of chyle leakage. Aerobic and microaerobic cultures yielded no growth, but after 36 h of incubation, anaerobic cultures of all three samples produced small, circular, convex, translucent, shiny, white colonies of Gram-negative rods. Matrix-assisted laser desorption ionization-time-of-flight (MALDI-TOF) mass spectrometry (Bruker Biotyper system, version 3.1 software and database, Bruker Daltonik GmbH, Bremen, Germany) identified the isolates as Prevotella bivia with log (scores) of 1.78 to 1.81 (5). They exhibited no growth in the presence of bile and no evidence of esculin hydrolysis.

In light of these findings, the patient was switched to intravenous clindamycin (600 mg/8 hours), and the in vitro susceptibility of the isolates was assessed with the Etest (bioMérieux, Marcy l’Etoile, France), as previously described (6). Interpreted according to EUCAST breakpoints (document version 3.1, February 2013; http://www.eucast.org/clinical_breakpoints), the results revealed susceptibility to amoxicillin/clavulanate (MIC, 0.06 mg/liter), piperacillin/tazobactam...
(MIC, 0.12 mg/liter), meropenem (MIC, 0.002 mg/liter), clindamycin (MIC, 0.016 mg/liter), metronidazole (MIC, 0.06 mg/liter), and chloramphenicol (MIC, 2 mg/liter), and full resistance to penicillin (MIC, > 0.5 mg/liter). Beta-lactamase positivity was documented by the cefinase disk method. All of the blood cultures were negative. Chest-tube drainage cultures for *Mycobacterium tuberculosis* and fungi yielded no growth. Isolates were re-tested on the Vitek 2 system with ANC cards (both from bioMérieux, Marcy l'Etoile, France), which identified all as *P. bivia*. The species-level identification was confirmed by 16S rRNA gene sequencing, which exhibited a 100% match with *P. bivia* strain (accession no. JN867300). On day 10, after 7 days of clindamycin, the patient was transferred to a rehabilitation center with a prescription for oral clindamycin (300 mg every 6 hours for 4 weeks). The 6-month follow-up assessment revealed full clinical and microbiological biological resolution of the empyema.

In 1990, 16 *Bacteroides* species were transferred to form the new genus *Prevotella*, which now includes 48 validated species of obligately anaerobic, pleomorphic, gram-negative rods (7, http://www.bacterio.net/classification.html). Human infections ascribed to *P. bivia* (or *Bacterioides bivius* as it was known then) had first been reported in 1987 (8). They frequently involve the female urogenital tract or, less commonly, the oral cavity, and they have been linked to an increased risk of preterm delivery [9, 10], an effect attributed to increased prostaglandin formation [11]. Recovery of *P. bivia*, alone or with other pathogens, has also been sporadically reported in patients with other types of infection (8, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26), including one with pleural effusions (8) and two with empyema (13). Unfortunately, none of the latter reports described the clinical findings of the cases or specified whether the infections were monomicrobial or polymicrobial.
Chylothorax and chylous pleural effusions are uncommon in adults (27, 28). They are diagnosed when the pleural drainage contains high levels of triglycerides (> 110 mg/dL) and no cholesterol crystals, and the supernatant appears milky, opaque (27). Causes vary widely (malignancy, natural or surgical trauma, deep vein thrombosis, sarcoidosis, congestive heart failure, malformations of the lymphatic trunks, parasitic infections), and some cases are idiopathic (27, 28, 29, 30).

Our patient had no history of surgery or trauma, and lymphoscintigraphy showed no evidence of a chyle leak. Chest CT scans performed to identify possible neoplastic disease revealed only nonspecific findings in the retrocrural area suggestive of inflammation, and there were still no signs of malignancy at the one-year follow-up visit. Hepatic disease was excluded, and there were no signs or symptoms of lymphatic disorders.

Pleural effusion can be provoked by any change in the pulmonary venous hydrostatic pressure, lymphatic pressure, or oncotic pressure, as well as by local tissue trauma or inflammation. Hydrostatic mechanisms seem to be the most likely cause of our patient’s chylothorax. The cardiology work-up had revealed clear evidence of chronic cor pulmonale, with a left-ventricular ejection fraction of 40% and a pulmonary arterial pressure of 54 mmHg. In addition, the patient’s recent episode of pulmonary microembolism might also have caused additional transient increases in the hydrostatic pressure of the pulmonary circulation. Collectively, these increases could have resulted in the leakage of chyle into the pleural space.

Pleural infection is a significant and increasingly common cause of morbidity and mortality worldwide (31). Persistent infections can lead to empyema, which is manifested by pus in the pleural fluid, positive culture, or positive Gram’s stain (32). The infection is usually associated with pneumonia, but primary infections without evidence of parenchymal lung involvement have been reported (32). In the case described here, a simple chylous pleural effusion evolved into multiloculated fibrinopurulent collections associated with clinical and biochemical features of
sepsis. The original effusion impeded re-expansion of the lung, impairing pulmonary function and creating a persistent pleural space at risk for infection, but it seems likely that alterations of the microbiota ecosystem also contributed to onset of infection (31). Anaerobic organisms are being recovered more and more frequently from patients with empyema, particularly those like our patient who are elderly with comorbidities and/or poor oral hygiene (31). Indeed our patient had been suffering for years from chronic periodontitis.

Delayed diagnosis and treatment of empyema are common (31). The clinical presentation varies. As in this case, the course may be indolent with nonspecific constitutional symptoms such as weight loss and pleuritic chest pain. Prompt drainage and effective antimicrobial treatment are essential for successful management of empyema (31). Our patient was initially treated with levofloxacin, but as soon as the pleural isolates were identified with MALDI-TOF mass spectrometry (36 hours after the culture was submitted), he was switched to clindamycin, which is characterized by good penetration of the pleural space (33). Twenty-four hours later, the appropriateness of this empirical decision was confirmed by in vitro susceptibility data. However, clindamycin resistance in Prevotella species is reportedly on the rise, so antibiogram guidance is imperative in severe infections caused by these organisms (6).

Acknowledgments:

We thank Marian Kent for editing the manuscript. This work was supported by Università Cattolica del Sacro Cuore (Fondi Ateneo, Linea D1-2012).
References:


due to *Prevotella bivia* following renal transplantation in a patient with an occluded inferior vena cava. Infection **41**:271-274.


**Figure Legend**

**Figure 1: Imaging findings**

At admission: chest X-ray showing the right lateral pleural effusions with loculated features (1a) and CT scan showing the two loculated pleural effusions described in the text (1b).