CASE REPORTS

Pleural Empyema Caused by *Gemella* Species: A Rare Condition

Cristina Senent, José Norberto Sancho, Eusebi Chiner, Jaime Signes-Costa, Ana Camarasa, and Ada Luz Andreu

Secció de Pneumologia, Hospital Universitari Sant Joan d’Alacant, Sant Joan d’Alacant, Alacant, Spain

Three cases of pleural empyema caused by *Gemella* species—2 caused by *Gemella morbillorum* and 1 caused by *G. haemolysans*—are reported. Microbiological characteristics, predisposing factors, and treatment are reviewed and all cases published in the literature are analyzed.

**Key words:** *Gemella morbillorum, Gemella haemolysans, Pleural empyema.*

**Introduction**

Microorganisms of the *Gemella* species are gram-positive cocci and facultative anaerobes which—like other human commensal bacteria—are opportunistic pathogens and may cause serious local and systemic infections, mainly in immunodepressed patients. The species *G. morbillorum* and *G. haemolysans* are the most important pathogens. *G. haemolysans* can cause endocarditis and meningitis, while *G. morbillorum* causes endocarditis, especially of native valves, septic arthritis, and meningitis, among others. Respiratory tract infections caused by *Gemella* species have rarely been reported but they can cause lung abscesses, necrotizing pneumonia, and pleural empyemas, while there are few publications referring to pleural involvement and these describe isolated cases.

We report 3 cases of pleural empyema caused by *Gemella* species, 2 caused by *G. morbillorum*, and 1 caused by *G. haemolysans*. We also review articles published in medical literature to date.

The protocol for identification was as follows. Gram staining revealed gram-positive cocci grouped together in chains. Samples were cultured on Columbia blood agar base and chocolate agar with incubation in an anaerobic chamber. After 48 hours of incubation, α-hemolytic, catalase-negative colonies were obtained that showed better growth in the anaerobic medium. Microorganisms were identified as *G. morbillorum* and *G. haemolysans* by means of the API 20 Strep system (CAPI System, BioMérieux, La Balme Les Crottes, Montalivet, France).

Antimicrobial susceptibility was ascertained with the Kirby-Bauer disk diffusion method.

**Case Descriptions**

**Patient 1**

The first patient was a 45-year-old male ex-smoker (30 pack-years) with an intake of 30 g of alcohol a day, a history of hypertension, and recently diagnosed atrial fibrillation. He was admitted for fever, right-sided pleuritic pain, shaking, and general malaise, with onset 25 days earlier. Of note in his clinical examination was obesity and symptoms of right pleural effusion. A chest x-ray and a computerized tomography (CT) scan showed right-sided, loculated pleural effusion with thickened visceral pleura and underlying condensation in the right lower lobe (Figure 1a). Diagnostic thoracocentesis was performed and a purulent fluid was obtained. Culture of this fluid revealed the growth of *G. morbillorum* susceptible to penicillin, cephalosporins, and aminoglycosides. Treatment commenced with a chest drain (total volume 1200 mL), fibrinolytics, and cefotaxime at a dose of 1 gram every 6 hours intravenously, as well as levofloxacin (500 mg every 12 hours, intravenously), for 16 days. Oral cefuroxime (500 mg every 12 hours) was then added, and treatment lasted for 26 days. A subsequent follow-up examination revealed minimal residual basal pleural thickening.
in the right lung. While in hospital, the patient developed a perianal abscess that required surgical drainage but no microbiological samples were available.

Patient 2

The second patient was a 59-year-old male former active smoker (40 pack-years), with an alcohol intake of 40 g a day and a history of personality disorder with dysthymia and somatization, benzodiazepine abuse which required 2 hospital admissions for drug-induced coma, and an episode of bronchial aspiration. The patient suffered from untreated sleep apnea-hypopnea syndrome, features of chronic bronchitis, and alcohol-induced chronic liver disease. The patient was admitted for a fever of 40ºC that started 15 days earlier, pleuritic chest pain in the left hemothorax, shivering, and malaise. In the physical examination, symptoms of pleural effusion in the lower half of the left hemothorax were notable. Chest x-ray and CT scan showed loculated pleural effusion in the left lung that formed 3 pockets of fluid (basal posterior, lateral and apicoposterior), and mediastinal lymphadenopathy (Figure 1b). Diagnostic thoracocentesis yielded a greenish, thick and putrid fluid with growth of *G. morbillorum* susceptible to penicillins and cephalosporins, and intermediate susceptibility to aminoglycosides. The patient was initially treated with a chest drain (total volume 1270 mL), fibrinolytics, and imipenem (500 mg intravenously every 6 hours) for 4 days. Once the microbiological results were available, amoxicillin-clavulanic acid was administered intravenously (2 g every 8 hours) for 4 days and then orally (875/125 mg every 8 hours) until day 24 of treatment. The clinical and radiologic outcome was satisfactory.

Patient 3

The third case was a 50-year-old female ex-smoker with stage 4 colon cancer. She had undergone surgery 7 years ago and had received several cycles of chemotherapy. She was admitted to hospital after 3 days of fever of 39ºC, cough, purulent sputum, and pleuritic pain in the right hemothorax. Her symptoms indicated pleural effusion in the lower two thirds of the right hemothorax. Chest x-ray and CT scan showed a bilateral pleural effusion with loculated predominance and infiltrations in its upper part, pulmonary infiltrate in the lower right lobe with abscessed areas and multiple pulmonary nodules related to previously diagnosed metastases (Figure 2). Thoracocentesis showed a serosanguineous, thick fluid with growth of *G. haemolysans* susceptible to penicillin, cephalosporins, and aminoglycosides. The patient was treated with a chest drain (1670 mL) and fibrinolytics together with intravenous amoxicillin-clavulanic acid (1 g every 8 hours) and levofloxacin (500 mg every 12 hours) for 10 days, before switching to oral administration (amoxicillin-clavulanic acid, 875/125 mg every 8 hours; levofloxacin, 500 mg every 24 hours) until she had completed 21 days of treatment. Her clinical and radiologic outcome was favorable.

Discussion

*Gemella* species are gram positive, facultative anaerobic, catalase negative cocci described for the first time in 1917 by Tunnicliff. The name of the genus was officially proposed by Berger in 1961 and included just 1 species at that time, *G. haemolysans*, previously known as *Neisseria haemolysans*. A second *Gemella* species, *G. morbillorum*, was added in 1988. This was previously classed as a
Streptococcus species. Today, *G haemolysans*, *G morbillorum*, *G bergeriae* and *G sanguinis* have all been classed as *Gemella* species based on DNA hybridization and 16S ribosomal RNA gene sequencing.21

*G haemolysans* has been found in 30% of pharyngeal swabs taken from the oral cavities and upper respiratory tracts of healthy individuals,23 whereas *G morbillorum* has also been found as a component of the human flora in the intestine and urogenital system.21,24

Due to their opportunistic nature, these species are capable of causing certain infections, the most common of which are septicemia,25 infections of the nervous system,3,26 arthritis,6 liver abscesses,27 and endocarditis.4,5 Cases of respiratory tract infections have been described such as necrotizing pneumonia,10,11 lung abscesses,4,9 and even colonization of the tuberculous cavity. However, the appearance of pleural empyema is considered exceptional. In a review of medical literature using MEDLINE we only identified 12 cases of pleural empyema caused by *G morbillorum*8,10,12,13,15-19 and 1 case caused by *G haemolysans*.14

The Table shows the characteristics of the 13 cases. Our study of 3 patients is one of the largest to have been published, with the exception of the review by García-Lechuz et al.,19 who described 4 cases of pleural empyema caused by *Gemella* species over a period of 4 years. The *Gemella* species described. Antibiotic susceptibility resembles that of *Streptococcus viridans*,30 therefore penicillin or ampicillin are the drugs of choice. Indeed, there are authors that recommend empirical treatment with penicillin G sodium,16 although occasional resistance to penicillin is argued as a rationale to commence treatment with beta-lactamases and aminoglycosides or, failing this, vancomycin.18 In cases of pleural empyema, there is insufficient information on the duration of treatment and so it is recommended to prolong treatment for at least 4 weeks10,13 or until the

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>No.</th>
<th>Age, y</th>
<th>Predisposing Factor</th>
<th>Antibiotic Treatment</th>
<th>Duration, d</th>
</tr>
</thead>
<tbody>
<tr>
<td>García del Busto et al12</td>
<td>1995</td>
<td>1</td>
<td>38</td>
<td>Poor mouth hygiene</td>
<td>CFX + TOB</td>
<td>–</td>
</tr>
<tr>
<td>Da Costa et al8</td>
<td>1996</td>
<td>1</td>
<td>–</td>
<td>Dental surgery, CF</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Hayashi e Ito11</td>
<td>1996</td>
<td>1</td>
<td>44</td>
<td>Dental caries, diabetic ketoadsosis, CLN + PAP</td>
<td>–</td>
<td>28</td>
</tr>
<tr>
<td>Marcos Sánchez et al11</td>
<td>2000</td>
<td>1</td>
<td>68</td>
<td>Bronchiectasis, monthly roxithromycin</td>
<td>IMP</td>
<td>30</td>
</tr>
<tr>
<td>Signes-Costa et al10</td>
<td>2000</td>
<td>1</td>
<td>47</td>
<td>Smoker, laryngectomy, microaspiration</td>
<td>CFX, CTX</td>
<td>30</td>
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<tr>
<td>Canet et al16</td>
<td>2001</td>
<td>1</td>
<td>75</td>
<td>AF, embolic CVA, aphasia + dysphagia</td>
<td>IMP, CFX + AZT</td>
<td>14</td>
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<tr>
<td>Poulou17</td>
<td>2002</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>AMX-C</td>
<td>70</td>
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<tr>
<td>García-Lechuz et al19</td>
<td>2002</td>
<td>4</td>
<td>54(36-75)</td>
<td>1. HIV + IVDA, PTB</td>
<td>IMP, CFX + AZT</td>
<td>4</td>
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<td></td>
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<td>2. Alcohol abuse</td>
<td>CTX + AZT</td>
<td>14</td>
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<td>3. COPD, alcohol abuse</td>
<td>IMP + CFX</td>
<td>–</td>
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<td></td>
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<td></td>
<td></td>
<td>4. Diabetes, hypertension</td>
<td>AMX-C + CFZ + CLN</td>
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<tr>
<td>Valipour et al18</td>
<td>2005</td>
<td>1</td>
<td>26</td>
<td>Epilepsy, IVDA</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Veziris et al18,14</td>
<td>1999</td>
<td>1</td>
<td>71</td>
<td>Smoker, COPD, carcinoma of the larynx, microaspiration</td>
<td>AMX-C</td>
<td>–</td>
</tr>
</tbody>
</table>

Abbreviations: AF, atrial fibrillation; AMX-C, amoxicillin-clavulanic acid; AZT, aztreonam; CF, cardiac failure; CFR, cefuroxime; CFX, ciprofloxacin; CFZ, cefazolin; CLN, clindamycin; COPD, chronic obstructive pulmonary disease; CTX, cefotaxime; CVA, cerebrovascular accident; ERT, erythromycin; HIV, human immunodeficiency virus infection; IMP, imipenem; IVDA, intravenous drug abuse; PAP, panimipenem; PTB, pulmonary tuberculosis; SXT, co-trimoxazole; TOB, tobramycin.

*Empyema caused by Gemella haemolysans.*
empiema is evacuated, as management of these patients is based on drainage of the empyema with therapeutic thoracocentesis, or chest drain. Cure following application of this measure without the need for antibiotic treatment has even been described. In our patients no penicillin resistance was found and patients followed antibiotic treatment with beta-lactamases for 3 to 4 weeks with a satisfactory clinical and radiologic outcome. In the 3 patients from our study we performed chest drainage— which exceeded 1000 mL in volume in all cases—and administered fibrinolytics.

To conclude, in the case of a patient with empyema, we must consider the possibility of infection caused by Gemella species, especially in immunodepressed patients or those having recently undergone digestive tract or dental procedures, or those patients with suspected nasopharyngeal microaspiration.

REFERENCES