Research Article

Bacterial Spectrum in Exacerbation COPD Patients.

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Abstract

The precise role of bacterial infection in the course of exacerbation COPD has been a source of controversy for decades. Chronic bacterial colonization of the lower airways contributes to airway inflammation; The course of COPD is characterized by intermittent exacerbations of the disease. Approximately 40-50% acute exacerbations are caused by bacteria, by viruses in 25%, and both viruses and bacteria in another 25%. Airway inflammation is increased during the exacerbation resulting in increased hyperinflation, reduced expiratory air flow and decreased gas exchange. Expectorated sputum is the most commonly used sample for diagnosis of lower respiratory tract infections (LRTI), which can be obtained easily and non-invasively.

Bacteria are very common in the lower respiratory tract of patients with COPD and cause inflammation. We have shown that among microorganisms causing acute exacerbations of COPD in our patients prevailed gram negative Enterobacteriaceae family and comparatively high resistance against cephalosporins and fluoroquinolones related to wide usage of antibiotics of this group for chemoprophylaxis.

Introduction:

Chronic obstructive pulmonary disease (COPD) is a major cause of chronic morbidity and mortality worldwide. The World Health Organization predicts that COPD will become the third leading cause of death worldwide by 2030. (1,2). Exacerbation of COPD is redefined as a sustained worsening of a patient’s condition from a stable state. The precise role of bacterial infection in the course of exacerbation COPD has been a source of controversy for decades. Chronic bacterial colonization of the lower airways contributes to airway inflammation; The course of COPD is characterized by intermittent exacerbations of the disease. Approximately 40-50% acute exacerbations are caused by bacteria, by viruses in 25%, and both viruses and bacteria in another 25%. Airway inflammation is increased during the exacerbation resulting in increased hyperinflation, reduced expiratory air flow and decreased gas exchange. (3,4,5).

Bacteria have established niches in the human body where they exist in symbiosis with their host. The term microbiome is used to refer to complex communities of microorganisms, termed the microbiota, that inhabit the body surfaces in symbiosis with the host. The most clearly defined microbiome occurs in the gastrointestinal tract in
which there are far more bacterial cells than in the whole human body (as bacteria are much smaller than human cells). Bacteria which form part of the normal flora of the microbiome, are tolerated by the local mucosal immune response with minimal activation of inflammatory cells, in particular T cells. The lower respiratory tract is directly connected to the upper respiratory tract with frequent micro-aspiration of secretions. (5, 6, 7).

Expectorated sputum is the most commonly used sample for diagnosis of lower respiratory tract infections (LRTI), which can be obtained easily and non-invasively. However, sputum may show a heavy growth of commensal organisms because of the necessity to traverse a highly contaminated oropharynx which may prevent the determination of true epidemiologic agent. A potentially phatogenic microorganism (PPM) had to grow in significant counts to be considered a potential causative agent of an exacerbation. (8, 9)

Major challenges remain in accurately defining the potential role of bacteria in the inflammatory process and how best to optimize the use of antibiotics without the overuse of this limited resource. The thresholds for positive cultures used in most of the recently published studies are as follows: ≥10³ or ≥10⁴ colony-forming units/millilitre (CFU/ml) for sputum, ≥10⁵ CFU/ml for bronchial lavage (BL) and ≥10² or ≥10³ CFU/ml for bronchoscopic protected specimen brush (PSB) and bronchoalveolar lavage (BAL) samples. Considering bacterial exacerbations, Gram-negative bacteria such as P. aeruginosa, Stenotrophomonas maltophilia and members of the Enterobacteriaceae family are more often present in patients with a greater degree of functional impairment, recent antibiotic or systemic steroid therapy, and in those with severe exacerbations. The rates of positive cultures in COPD vary depending on the sampling technique. (10)

The aim of the study was the bacteriological examination of expectorated sputum taken from COPD patients during exacerbation, identification of microbes and studying their sensitivity to antibiotics for the purpose of optimization of antibiotic therapy.

**Material and Methods:**
We retrospectively have studied the medical records of the 17 patients of the University Clinic at TSMU Department of Therapy and Cardiology from 2015-2016. Acute exacerbation was defined as the presence of an increase in at least two of the three following symptoms: dyspnea, cough and sputum production. At least one sample of spontaneously expectorated sputum for microbiological evaluation was obtained from all patients during admission for aerobic gram-positive and gram-negative bacteria. An early morning sample was preferred. Specimens were collected according to standard guidelines (Baron and Thomas, 2012). Sputum samples were plated on 5% Sheep blood agar, Chocolate agar, Endo agar and Sabouraud dextrose agar and incubated at 37 °C for both 24 h and 48 h. All microorganisms isolated were identified through standard laboratory methods: isolation of poor culture, identifying microbes with rapid identification system (API 20E, API Staph, API haemo, API Strep, API 20NE, biomerieux). Sensitivity of microorganisms to antibiotics was defined with disc-diffusion method using standard discs (EUCAST guidelines). Rapid tests for identification of oxidase and catalase.

**Results:**
In 12 patients, monomicrobial growth has been documented by bacteriological investigation, among which gram-negative bacteria prevailed, namely Klebsiella pneumonia ≥10³ colony-forming units/millilitre (CFU/ml) in 5 patients, Escherichia coli ≥10⁵ colony-forming units/millilitre (CFU/ml) – 2, Proteus mirabilis 10⁵ CFU/ml – 1. Among gram-positive bacteria Enterococcus spp ≥10³ colony-forming units/millilitre (CFU/ml) was in 2 patients, Staphylococcus aureus -1, Streptococcus pneumonia -1. Polymicrobial growth were observed in 5 cases: Klebsiella pneumonia 10⁵ CFU/ml and Candida albicans 10⁵ CFU/ml – 3, Escherichia coli 10⁵ CFU/ml and Enterococcus spp 10⁵ CFU/ml – 1, Staphylococcus aureus 10⁵ CFU/ml – 1, Enterococcus spp ≥10⁵ CFU/ml – 1. By defining sensitivity on local antibiotics on strains isolate by us only 12% of gram-negative bacteria was resistant on quinolones, 19% to the third generation of cephalosporins, and among gram-positive bacteria methicillin-resistant Staphylococcus aureus and vancomycin-resistant Enterococci was not found. Comparatively high resistance against cephalosporins and quinolones related to wide usage of antibiotics of this group for chemoprophylaxis.

**Conclusion:**
The bacteria are very common in the lower respiratory tract of patients with COPD and cause inflammation. We have shown that among microorganisms causing acute exacerbations of COPD in our patients prevailed gram...
negative Enterobacteriaceae family and comparatively high resistance against cephalosporins and fluoroquinolones related to wide usage of antibiotics of this group for chemoprophylaxis.

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