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Routine use of pleural fluid cultures. Are they indicated? Limited yield, minimal impact on treatment decisions

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Summary In pleural infection, it has been recommended that Gram stain and cultures should be obtained on a routine basis. However, this recommendation has not been tested prospectively. We evaluated the yield of microbiological studies in 259 patients with parapneumonic pleural effusion. Microbiological studies were positive on the pleural fluid of 50 patients (19.3%). In 48 of the 50 patients with positive microbiological results (96%), the need for pleural drainage was correctly predicted by pleural fluid parameters. There were no differences in hospital stay (9.5 ± 2.5 days versus 9.9 ± 3.2 days, $P = 0.68$) or in mortality (2 deaths in each group, $P = 0.58$) between the group of patients in which antibiotic treatment was changed according to microbiological results and the group of patients in which it is not. In conclusion, this study demonstrates that, at least in our institution, routine microbial investigation of pleural fluid adds very little to the standard management of parapneumonic effusions.

Introduction

Pleural effusions develop in up to 44% of patients with community-acquired pneumonia (CAP).[1] Current guidelines for the management of pneumonia

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and parapneumonic effusions do not recommend routine sputum culture and Gram's stain but generally agree in recommending pleural fluid microbiological studies to direct antibiotic treatment and need for pleural drainage.[2–4] Most clinicians obtain Gram stains and cultures of pleural fluid in the evaluation of their patients with parapneumonic pleural effusions (PPEs). However, the utility of pleural fluid stains and cultures as a diagnostic tool has not been prospectively evaluated. To our knowledge, there are no studies assessing the impact of microbiological studies on treatment decisions and patient outcomes.

We conducted a prospective study of patients with PPE in order to assess the usefulness of the pleural fluid stain and culture in guiding the initial antibiotic therapy and need for pleural drainage. We hypothesized that pleural fluid smears and cultures would be positive in only a minority of patients and would not contribute significantly to patient management.

Methods

Patients and study design

All patients diagnosed as having PPE in the Respiratory Department between January 1995 and December 2000 were candidates for the study. We prospectively included all patients with pleural exudates associated with pneumonia who underwent diagnostic thoracentesis. Patients with antibiotic use during the week prior to hospitalization were excluded from this study. Patients with human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) or bronchiectasis were also excluded.

Patients with positive microbiological cultures in the pleural fluid in the pleural space were separated into two groups: in one group antibiotic therapy was changed based on culture and susceptibility studies; in the other group antibiotic therapy was not changed by decision of the attending physicians, according to the clinical evolution of patients.

Microbiological studies

Pleural fluid specimens were inoculated into blood culture media at the bedside for both aerobic and anaerobic cultures. Pleural fluid specimens were sent immediately to the local hospital laboratory for Gram staining.

Definitions

A parapneumonic effusion is an accumulation of exudative pleural fluid associated with an ipsilateral pulmonary infection. Empyema is frank pus in the pleural space.

Treatment of patients

All patients were treated according to current guidelines along the study period.[4,5] Pleural fluid drainage was instituted when the pleural fluid pH was less than 7.20, the pleural fluid LDH was higher than 1000 IU/L (upper normal limit for serum 300 IU/L), the pleural fluid was pus, or when the Gram stain or culture were positive. The presence of loculations in the pleural space or empyema served as an indication for the use of thrombolytic agents. If the patients deteriorated despite these treatments, they were referred for thoracoscopy.

Measurements

The following end points were recorded: yield of the microbiological studies among PPE, the yield of Gram stain as compared with cultures, the usefulness of pleural fluid parameters to predict need of pleural drainage and the impact of microbiological studies on mortality and hospital in-stay.

Statistical analysis

Statistical analysis was performed using computer software (SPSS for Windows, version 10.0; SPSS Inc., Chicago, IL). Results were expressed as mean $\pm$ SD unless otherwise stated.

The means of parameters with a normal distribution were compared using the Kolmogorov–Smirnov test. The characteristics of the patients in the two groups were compared using the χ^2-test with Fisher's or Yates correction for non-continuous variables, the non-parametric Mann–Whitney *U*-test for continuous variables with non-normal distribution and Student's *t*-test for those with normal distribution.

Two-tailed *P* values of 0.05 or less were considered statistically significant.

Results

During the study, 259 potentially eligible patients with PPEs were evaluated. Microbiological studies were positive on the pleural fluid of 50 patients (19.3%). A detailed list of the pathogens involved is