Diagnostic role of fiberoptic bronchoscopy in suspected smear negative pulmonary tuberculosis

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Fiberoptic bronchoscopy with bronchoalveolar lavage (BAL) and transbronchial biopsy (TBB) was performed in 40 patients suspected to have pulmonary tuberculosis, in whom chest roentgenogram revealed minimal infiltration and sputum smears were negative for acid-fast bacilli. Bronchoscopic procedures provided overall diagnostic yields in 47.5% (19/40) of patients. The diagnostic yield of overall bronchoscopic procedures for tuberculosis in this study was 32.5% (13/40) of patients. It consisted of positive BAL smear in 7.5% (3/40) of patients, positive for mycobacterial culture in 15% (6/40) of patients and TBB revealing granuloma in 17.5% (7/40) of patients. Non-tuberculosis conditions were diagnosed by the bronchoscopic method in six patients (15%). These results suggest that in an area with a high prevalence of tuberculosis, bronchoscopic procedures should be performed in those cases in which other diagnoses such as malignancy must be ruled out. Transbronchial biopsy has a major role for early diagnosis and should be performed in all cases, if possible.

Introduction

Bronchoalveolar lavage (BAL) has been used with great success as a tool for recovering pathogenic micro-organisms from the lower respiratory tract of individuals with pulmonary infiltrates. The performance of BAL is technically straightforward, although the best yields and fewest complications are obtained by a skilled bronchoscopist with moderate experience with BAL. As BAL is a relatively safe and rapid procedure, its diagnostic use in immunocompromised patients and immunocompetent patients with pulmonary infiltrates may, in selected circumstances, offer an alternative to more invasive and dangerous procedures. Bronchoalveolar lavage has potential use for the study of infectious disease of the lung from the point of detailing the host's local inflammatory and immune responses to pulmonary infection. Cell populations present in lavage fluid during the acute phase of bacterial infection show a predominance of neutrophils, while lymphocytes increase in proportion during the resolution phase. The lavage fluid of patients with chronic infectious processes such as tuberculosis shows an absence of neutrophils and an increase in lymphocyte number.

Those patients whose chest roentgenograms reveal minimal infiltration and whose sputum smears were negative for acid-fast bacilli faced a big problem for diagnosis in clinical practice. This study was thus designed to determine the yield of fiberoptic bronchoscopy (FOB) and BAL for the diagnosis of patients whose chest roentgenograms show minimal infiltration resembling tuberculosis.

Material and Methods

PATIENTS

Forty male and female patients (24 males, 16 females) aged 16-78 years (mean 65 years) suspected to be smear negative pulmonary tuberculosis were recruited to the study. They had minimal infiltrations on chest roentgenogram (Table 1).

PROCEDURES

The trial was conducted in accordance with the Declaration of Helsinki and the protocol was approved by the Ethics Committee of Siriraj Hospital, prior to patient recruitment. Patients were required to give their verbal or written consent to participate in the study.

All patients underwent FOB with BAL and TBB as complementary diagnostic procedures. Bronchoalveolar lavage was performed in the supine position by infusion of six aliquots of 20 ml normal saline. The return was quantified and submitted for blinded laboratory investigations. Bronchoalveolar lavage was performed in the lobe with greatest parenchymal infiltrates when there was localizing disease. When infiltrates were symmetrically diffused, the middle lobe or lingula was sampled. All
Table 1 Radiological manifestations (n=40)

<table>
<thead>
<tr>
<th>Radiological manifestation</th>
<th>No. of cases</th>
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</thead>
<tbody>
<tr>
<td>Minimal infiltration in upper lobe</td>
<td>31</td>
</tr>
<tr>
<td>Far advanced disease</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 2 Clinical manifestations (n=40)

<table>
<thead>
<tr>
<th>Clinical manifestation</th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic</td>
<td>14</td>
</tr>
<tr>
<td>Fever</td>
<td>17</td>
</tr>
<tr>
<td>Cough</td>
<td>13</td>
</tr>
<tr>
<td>Weight loss</td>
<td>15</td>
</tr>
<tr>
<td>Dyspnoea</td>
<td>7</td>
</tr>
<tr>
<td>Haemoptysis</td>
<td>2</td>
</tr>
</tbody>
</table>

specimens for tuberculosis smear and culture were processed by a single laboratory. Ground tissue and concentrated specimens were examined microscopically for acid-fast bacilli (AFB) using Kinyoun modification of Ziehl-Neelsen's staining. The specimens were plated on Lowenstein Jensen and Middlebrook 7H11 culture media. Formalin-fixed histologic preparations were interpreted by staff pathologists at Siriraj Hospital.

Results

Forty patients were recruited into the study. Their clinical manifestations and radiological features are shown in Tables 1 and 2.

The final diagnoses in the 40 patients are shown in Table 3. Bronchoscopic procedures provided overall diagnostic yields in 19 patients (47.5%). Of these, 13 (32.5%) cases of tuberculosis were diagnosed. The BAL smears were positive AFB in three patients (7.5%), BAL cultures were positive for Mycobacterium tuberculosis in six patients (15%) and TBB revealing granuloma in seven patients (17.5%).

Non-tuberculosis conditions were diagnosed by bronchoscopic method in six patients (15%), including adenocarcinoma, Pneumocystis carinii pneumonia and bacterial pneumonia (Table 3).

The cellular composition of BAL in pulmonary tuberculosis is shown in Table 4, revealing the increase in percentages of lymphocytes and neutrophils.

Discussion

In a country such as Thailand where the prevalence of tuberculosis is high, patients affected with pulmonary lesions compatible with tuberculosis who show a negative smear for acid-fast stain will be treated with anti-tuberculosis agents. This strategy is useful in most cases with the advantage of avoiding invasive diagnostic procedures. However, if this strategy was applied to non-tuberculosis cases, e.g. bronchogenic carcinoma, other infections etc., this may lead to delays of treatment resulting in poor outcome. Bronchoscopy and related procedures such as BAL and TBB may be an alternative way to reach diagnosis as early as possible without serious complications. Bronchoalveolar lavage, which is known to be safe and simple, may be the most useful diagnostic procedure if its diagnostic yield is high enough.

The diagnostic yield of overall bronchoscopic procedures for tuberculosis in this study was 32.5% (13/40) of patients. It consisted of positive BAL smear in 7.5% (3/40) of patients, positive for mycobacterial culture in 15% (6/40) of patients and TBB revealing granuloma in 17.5% (7/40) of patients. Although BAL gave a diagnostic yield of about 15%, its role in early diagnosis was very limited because smear stained for AFB gave positive results in only 7.5% (3/40) of patients. Since TBB gave a diagnostic yield of 17-5%, its role in early diagnosis was supported by these results.

The values of diagnostic yield for BAL and TBB cannot be compared with those reported in the literature because almost all report as a sensitivity
value. Baughman et al. (1) retrospectively studied 50 patients and revealed sensitivity of positive smear and positive culture in bronchial wash or BAL as 68% and 92% respectively. Chan et al. (2) reported positive smear results of bronchoscopic techniques and post-bronchoscopy sputum examination in 14% (4/28) of patients and positive culture results in 50% of patients. The low sensitivity of positive smear in this study resembles our study.

Non-tuberculosis conditions were diagnosed by bronchoscopic method in six patients (15%). This value should be included when considering overall diagnostic utility and these results are also useful for making decisions regarding management. Bronchoscopy is needed in this group of patients because a delay in diagnosis by trying anti-tuberculosis treatments may result in a poor outcome.

Regarding the cellular components of BAL in pulmonary tuberculosis, the results seem to reveal the increase in percentages of lymphocytes and neutrophils. Due to the lack of a normal control value in this population, it is not statistically confirmed.

The literature has both supported and disputed the diagnostic role of bronchoscopy for patients suspected of having tuberculosis (1–4). In a report by Danek and Bower (5), FOB with a collection of bronchial wash, brush and post-bronchoscopy sputum specimens frequently provided positive smears and cultures, and some cases of coexisting malignancy were detected in 41 patients with sputum smears negative for tuberculosis. In several other studies, the yield of FOB for diagnosing tuberculosis has been questioned (6,7). Kvale et al. (8) found that 68% of patients with documented tuberculosis, one-third of whom were receiving anti-tuberculosis therapy, had negative bronchial wash specimens from FOB. They concluded that cultures of sputum and/or gastric washings are sufficient when the clinical diagnosis is tuberculosis. These studies, however, provide limited information as they only report the results of bronchial washings; specimens found by the authors of this paper to have limited use in documenting tuberculosis.

In this series, the most useful contribution of BAL/TBB was in providing immediate evidence of mycobacterial disease. Positive microscopic specimens were obtained in three of 40 (7.5%) procedures performed on patients with previously undiagnosed tuberculosis. This study found the bronchoscopy specimen obtained by TBB to have the best yield for an immediate diagnosis (17.5%). This finding corresponds with the reports of Wallace (9) and Danek (5).

In conclusion, bronchoscopic procedures provided overall diagnostic yields in 47.5% of cases. These procedures have the diagnostic yield for pulmonary TB in 32.5% of cases and should be performed in those cases which other diagnoses such as malignancy must be ruled out. Transbronchial biopsy has a major role for early diagnosis and should be performed in all cases, if possible.

References