The Role of Fiberoptic Bronchoscopy for Diagnosis of Pulmonary Tuberculosis in Patients at Risk for AIDS*

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In patients with acquired immunodeficiency syndrome (AIDS)-associated pulmonary Mycobacterium tuberculosis (MTB) (group 1), we analyzed whether the addition of transbronchial biopsy (TBB) and bronchial brushings augmented the diagnostic MTB yield over nonbiopsy sampling. Positive acid-fast bacilli (AFB) smears from combined sputum, bronchoalveolar lavage (BAL), and washings were seen 30 percent compared with 37 percent when brushings and TBB were added (p = NS). The addition of TBB increased culture yield from 96 percent to 100 percent (p = NS). Similar results were seen in patients with pulmonary MTB without human immunodeficiency virus (HIV) risk factors (group 2). Group 1 patients most commonly had a nonspecific inflammation on TBB histopathology and had a lower incidence of granuloma formation than group 2 (p<0.05).

Our results suggest that more invasive sampling with bronchial brushings and TBB does not contribute to the microscopic, bacteriologic, or histopathologic diagnosis of pulmonary MTB, independent of AIDS risk factors.

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Pulmonary infection due to Mycobacterium tuberculosis (MTB) has been noted with increasing frequency in persons infected with human immunodeficiency virus (HIV). Although not diagnostic of acquired immunodeficiency syndrome (AIDS), pulmonary tuberculosis has been reported in conjunction with other Centers for Disease Control (CDC)-defined opportunistic infections or more commonly, during the prodromal stages of HIV diseases. In these patients, the clinical and roentgenographic features of pulmonary tuberculosis are often atypical and indistinguishable from those due to other opportunistic pathogens. Diagnostic fiberoptic bronchoscopy (FOB) is often performed before final results of sputum analysis are available to exclude other common infections such as Pneumocystis carinii pneumonia (PCP). Therefore, we sought to (1) evaluate the relative diagnostic contribution of sputum and various bronchoscopically obtained specimens for MTB, and (2) determine whether the addition of transbronchial biopsy (TBB) or brushings improved the diagnostic yield over sputum, bronchial washings, and bronchoalveolar lavage (BAL).

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Methods

Patients with positive M tuberculosis cultures from any bronchoscopic specimen from Jan 1, 1986 to Dec 31, 1986, from King's County Hospital Center and Woodhull Medical and Mental Health Center, Brooklyn, NY, were selected for study. Patients' charts were reviewed and a history of HIV risk behavior, clinical stigmata of HIV infection (oral Candida, lymphadenopathy), and associated CDC-defined opportunistic infections or tumors were noted. Patients were divided into two groups based on the above information. Group 1 (n = 27) consisted of patients who underwent FOB because they were suspected of having HIV-related pulmonary abnormalities based on clinical history. Patients without risk factors who underwent FOB and had documented MTB were designated as group 2 (n = 16). Diagnostic FOB was performed by faculty and trainees of the Pulmonary Division. The nature of specimens obtained during the procedure was at the discretion of the participating physicians. BAL was performed in the lobe with greatest parenchymal infiltrates when there was localizing disease. When infiltrates were symmetrically diffuse, the middle lobe or lingula was sampled. Between 100 and 200 ml of normal saline solution at room temperature was instilled into the selected lobe with an average of 50 percent return available for analysis. The amount of intraoperative lidocaine applied to the airways varied between patients and was titrated to patient comfort and cough suppression.

All specimens for tuberculosis smear and culture were processed by a single microbiology laboratory. Sputum, bronchial washings, and BAL were pretreated with 2 percent NaOH solution and concentrated by centrifugation at 5,000 rpm for 15 min, decanting supernatant and repeating centrifugation. Ground tissue and concentrated specimens were examined microscopically for acid-fast bacilli (AFB) using the 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 each respective institution. Statistical comparison of the diagnostic yield of combined specimens within the same group was done by t test of proportions. Comparisons between the two groups were calculated by an unpaired Student's t test. Values less than 0.05 were considered statistically significant.
Table 1—HIV-Associated Opportunistic Infections or Diagnosis in Group 1

<table>
<thead>
<tr>
<th>Previous</th>
<th>Concurrent</th>
<th>Subsequent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esophageal Candida</td>
<td>1 PCP</td>
<td>5 PCP</td>
</tr>
<tr>
<td>CNS lymphoma</td>
<td>1 Esophageal Candida</td>
<td>2</td>
</tr>
<tr>
<td>Oral Candida</td>
<td>2</td>
<td>13</td>
</tr>
</tbody>
</table>

*HIV = human immunodeficiency virus; CNS = central nervous system; PCP = Pneumocystis carinii pneumonia.

RESULTS

The high-risk activities in group 1 patients included intravenous drug abuse (16), homosexuality (three), blood transfusion (one), and other (seven). Within this group, 18 patients had documented signs of HIV disease (Table 1). The individual diagnostic yield of sputum and FOB specimens by direct smear and culture is summarized in Figure 1. In group 1, sputum and pooled bronchial washings had the highest proportion (23 percent and 26 percent, respectively) of positive AFB smears, while BAL and washings (95 percent each) had the highest yield by culture. In group 1, the diagnostic yield of positive AFB smears from combined sputum, BAL, and bronchial washings was 30 percent compared with 37 percent when bronchial brushings and TBB were added (p = NS). The addition of TBB increased the culture yield from 96 percent to 100 percent (p = NS). The group 2 yield from direct smears and cultures was not significantly different from group 1 (Fig 1 and 2). The histopathologic condition of the TBB submitted from each group is described in Table 2. A nonspecific inflammatory response was the most commonly reported finding in group 1. Granuloma formation was seen in only 9 percent of biopsy specimens in the high-risk group.

![Figure 1](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21644/ on 06/21/2017)

![Figure 2](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21644/ on 06/21/2017)
compared with 63 percent in the control population (p<0.05).

DISCUSSION

During bronchoscopic evaluation of pulmonary pathologic processes in suspected AIDS patients, BAL is almost always performed. Other sampling modalities such as bronchial brushing, transbronchial needle aspiration, and TBB are used less consistently. Although BAL has a reported sensitivity between 94 and 99 percent for detecting PCP, it is not known which specimens are necessary to adequately maximize the detection of AIDS-associated pulmonary MTB.

Our study suggests that a combination of sputum, bronchial washings, and BAL analysis is sufficient to establish the microscopic and culture diagnosis of pulmonary MTB (without TBB) in the AIDS population (Group 1). These findings were similar in our group 2 patients and consistent with previous studies from an unselected population where TBB did not make additional contributions to the diagnosis of pulmonary MTB. In only one instance in this series was culture of the TBB the sole modality by which the diagnosis was established. Similarly, nonbiopsy bronchoscopic sampling methods have proved adequate for diagnosing AIDS-associated cryptococcal pulmonary disease as was recently reported from our institution. In addition, the relative rarity of a normal cell-mediated granulomatous tissue reaction to the presence of MTB (nondiagnostic histopathologic condition in 91 percent of the TBB) further reduces the diagnostic utility of the lung biopsy.

The purified protein derivative (PPD) status and HIV serology of our patients were not consistently available for all patients. Furthermore, skin and serologic testing results are often not routinely available prior to the clinically driven decision to proceed with diagnostic FOB. Also, the high incidence of anergy among HIV-infected patients makes a PPD testing a less reliable marker for the presence of tuberculosis infection.

Interestingly, in the high-risk group, the presentation of pulmonary disease due to MTB most often occurred simultaneously with other opportunistic pathogens (Table 1). Although Candida infection was most commonly detected, 19 percent (5/27) had concurrent PCP. These data underscore the importance and value of early diagnostic FOB with submission of appropriate specimens to detect the wide array of pulmonary infections typically occurring in these patients with complex conditions. Our data may seem at variance with previous studies where pulmonary MTB was frequently diagnosed as the earliest evidence of host immunodeficiency. However, patients were selected if they had documented MTB and underwent diagnostic FOB. Thus, our population is biased toward a group that was more likely to undergo FOB because of a greater suspicion of having PCP as the primary diagnosis. The 19 percent incidence of concurrent MTB and PCP in this series is similar to that reported by others.

In both groups of patients, bronchoscopy did not statistically improve immediate or ultimate MTB diagnosis over sputum alone. Although the utility of bronchoscopy in patients with smear-negative sputum is often debated in the literature, it was not the intention of this study to address this issue. We sought to determine which bronchoscopic specimens are sufficient to properly evaluate suspected AIDS patients for pulmonary MTB infections. If nonbronchoscopic specimens, such as induced-sputum obtained as part of the evaluation for PCP, are employed as the first diagnostic tool, then independent considerations must be given to other possible concurrent pulmonary infectious complications such as tuberculosis.

In summary, our results suggest that more invasive diagnostic sampling with bronchial brushing and TBB does not contribute to the microscopic, bacteriologic, or histopathologic diagnosis of AIDS-associated pulmonary MTB. Furthermore, the risk-benefit ratio for all invasive procedures should be optimized in these frequently hypoxemic and seriously ill patients. The information gained by TBB must be weighed against a more prolonged procedure, risk of bleeding and pneumothorax, fluoroscopic radiation exposure, and cost-effectiveness. The combination of sputum, washings, and BAL appropriately stained and cultured for mycobacteria appears sufficient.

REFERENCES

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