The Value of Bronchial Washings and Bronchoalveolar Lavage in the Diagnosis of Lymphangitic Carcinomatosis*

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This study examines the value of bronchoalveolar lavage (BAL) in diagnosing lymphangitic carcinomatosis. A retrospective analysis of fiberoptic bronchoscopic records at a tertiary referral hospital was performed. Twelve patients with neoplastic disease and diffuse pulmonary infiltrates compatible with lymphangitic carcinomatosis who underwent diagnostic fiberoptic bronchoscopy were identified. Bronchoalveolar lavage correctly identified five (100 percent) out of five patients, bronchial washings identified four (57 percent) of seven patients and either procedure identified nine (75 percent) of 12 patients. Bronchial brushings were positive in two (40 percent) of five patients, and transbronchial lung biopsy confirmed the diagnosis in only four (44 percent) of nine patients. Transbronchial lung biopsy was uniquely positive in only one patient. One patient had a significant pulmonary hemorrhage following transbronchial lung biopsy, while no complications of BAL occurred. Two patients had significant coagulopathy, and one patient was severely agitated precluding transbronchial lung biopsy, and all three were positive by BAL. This study suggests that BAL should be performed to confirm the diagnosis of lymphangitic carcinomatosis before proceeding to a biopsy, especially when the risks of pneumothorax and hemorrhage are excessive. (Chest 1988; 94:1028-30)

In patients with underlying neoplastic disease, the presumptive diagnosis of lymphangitic carcinomatosis is usually based on a characteristic but not pathognomonic radiographic pattern of progressive diffuse reticular interstitial pulmonary infiltration with or without hilar enlargement.1,2 Invasive diagnostic procedures that are used to confirm the diagnosis include open lung biopsy, percutaneous aspiration needle biopsy, and transbronchial biopsy;3 however, these procedures pose significant risks and may be deemed unacceptable in patients with underlying advanced malignant neoplasms. Less invasive methods of confirming the diagnosis would clearly be desirable. Bronchoalveolar lavage (BAL) is a generally safe and well-tolerated procedure. The purpose of this study is to assess the sensitivity of bronchial washings and BAL in confirming lymphangitic spread of cancer.

Materials and Methods

A six-year (1981 to 1987) review of the fiberoptic bronchoscopic records of patients with underlying malignant disease at the City of Hope National Medical Center, Duarte, was performed. Twelve patients were identified who underwent fiberoptic bronchoscopy to evaluate radiographic findings suggestive of lymphangitic carcinomatosis. Patients were excluded if discrete pulmonary nodules suggestive of hematogenous metastasis were present on the chest x-ray film or if an endobronchial lesion was visualized at bronchoscopy. The following information was recorded: demographic data; hematologic and coagulation parameters; radiographic findings; histology and site of the primary neoplasm; bronchoscopic findings; cytologic results of sputum, bronchial washings, BAL, and brushings; and histology of transbronchial biopsy specimens. It was noted whether any complications of fiberoptic bronchoscopy had occurred. Bronchoalveolar lavage of the right middle lobe or lingula was performed using 20 ml aliquots of physiologic saline solution to a total volume of 200 ml, according to published methods.4

Results

Twelve patients with lymphangitic carcinomatosis who satisfied the criteria for inclusion and exclusion in this study were identified. There were ten women and two men whose ages ranged from 37 to 74 years, with a mean of 58 years (Table 1). The primary lesion was adenocarcinoma of the breast in eight (67 percent) of the 12 patients, adenocarcinoma of the prostate in one, adenocarcinoma of the colon in one, transitional cell carcinoma of the bladder in one, and squamous cell carcinoma of the lung in one patient. The tumor was classified as an adenocarcinoma in a total of ten (83 percent) of the 12 patients. One patient had prolongation of the prothrombin time, and another had thrombocytopenia precluding transbronchial lung biopsy. Severe agitation and uncontrolled cough precluded brushings and transbronchial lung biopsy in an additional patient. Cytologic analysis of sputum showed neoplastic cells in two (50 percent) of four patients, although these results were not available prior to bronchoscopy. Bronchial washings confirmed neoplastic cells in both of these patients and in an additional two patients (total, four of seven, 57 percent). Bronchoalveolar lavage revealed malignant cells

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Value of Bronchial Washings and BAL in Lymphangitic Carcinomatosis (Levy, Horak, Lewis)
**Table 1—Clinical and Diagnostic Details of Patients with Lymphangitic Carcinomatosis**

<table>
<thead>
<tr>
<th>Patient, Sex, Age (yr)</th>
<th>Primary Cancer</th>
<th>Sputum</th>
<th>Bronchial Washings</th>
<th>BAL</th>
<th>Bronchial Brushings</th>
<th>Transbronchial Biopsy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, F, 61</td>
<td>Bladder</td>
<td>Positive</td>
<td>Positive</td>
<td></td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>2, M, 72</td>
<td>Prostate</td>
<td>Negative</td>
<td>Negative</td>
<td></td>
<td>Negative</td>
<td>Positive</td>
</tr>
<tr>
<td>3, F, 64</td>
<td>Breast</td>
<td>Negative</td>
<td>Positive</td>
<td></td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>4, F, 47</td>
<td>Breast</td>
<td>. . .</td>
<td>Positive</td>
<td></td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>5, F, 74</td>
<td>Colon</td>
<td>. . .</td>
<td>Positive</td>
<td></td>
<td>. . . . *</td>
<td>. . . *</td>
</tr>
<tr>
<td>6, F, 56</td>
<td>Breast</td>
<td>. . .</td>
<td>Positive</td>
<td></td>
<td>Negative</td>
<td></td>
</tr>
<tr>
<td>7, F, 59</td>
<td>Breast</td>
<td>. . .</td>
<td>Positive</td>
<td></td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>8, F, 37</td>
<td>Breast</td>
<td>. . .</td>
<td>Negative</td>
<td></td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>9, M, 66</td>
<td>Lung</td>
<td>. . .</td>
<td>Negative</td>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>10, F, 59</td>
<td>Breast</td>
<td>. . .</td>
<td>Positive</td>
<td></td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>11, F, 47</td>
<td>Breast</td>
<td>Positive</td>
<td>Positive</td>
<td></td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>12, F, 51</td>
<td>Breast</td>
<td>. . .</td>
<td>Positive</td>
<td></td>
<td>Positive</td>
<td>Positive</td>
</tr>
</tbody>
</table>

*Not done because of coagulopathy.
†Open lung biopsy demonstrated lymphangitic carcinomatosis.
§Diagnosis not confirmed histologically.
$Not done because of severe agitation and coughing.

in all five patients who underwent this procedure (100 percent). Respiratory tract secretions from any source confirmed the diagnosis in nine (75 percent) of the 12 patients. Bronchial brushings were obtained in five patients and were positive in only two (40 percent) of those five, both of whom also had malignant cells in bronchial washings. Transbronchial lung biopsy under fluoroscopic guidance was performed in nine patients, and histologic documentation of lymphangitic spread was obtained in four (44 percent) of those nine. In only one patient did the transbronchial biopsy provide unique information to confirm lymphangitic carcinomatosis. One patient required open lung biopsy to prove the diagnosis after a nondiagnostic bronchoscopy, and in one patient the diagnosis was not confirmed prior to death (BAL was not done in either patient). One patient had a significant pulmonary hemorrhage following transbronchial lung biopsy, but no complications occurred that were attributable to BAL.

**DISCUSSION**

Diffuse interstitial pulmonary infiltrates in patients with underlying malignant disease has a wide differential diagnosis. Transbronchial lung biopsy has been advocated as being the procedure of choice for establishing the diagnosis. Ventilation-perfusion lung scan demonstrating an irregular peripheral perfusion defect has been suggested to be helpful in raising the suspicion of lymphangitic carcinomatosis but has poor specificity and undocumented sensitivity. Bronchialveolar lavage is a safe, commonly used procedure which has been referred to as a "liquid biopsy of the lung." A wide variety of inflammatory and infectious diseases have been documented by BAL, but its use in diagnosing neoplastic disease has been limited.

In this review, BAL confirmed the diagnosis of lymphangitic carcinomatosis in all patients in whom it was used. Routine bronchial washings yielded the diagnosis in a satisfactory 57 percent of patients (four of seven), and the combination of sputum, bronchial washing, or BAL confirmed the diagnosis in 75 percent (9/12). This yield could potentially have been increased if BAL had been used in all patients. Of importance is the finding that BAL confirmed lymphangitic carcinomatosis in all of the patients in whom transbronchial biopsy or brushing was precluded on the basis of coagulopathy or inability to cooperate. Moreover, the latter two procedures were found to be less sensitive than BAL in establishing the diagnosis. No complications with BAL were documented, while one patient had a significant pulmonary hemorrhage following transbronchial lung biopsy. Bronchial brushings did not provide any unique diagnostic information compared with bronchial washings and BAL.

This retrospective study has demonstrated the value of BAL as a safe and relatively noninvasive method of confirming lymphangitic carcinomatosis. We therefore advocate that BAL be performed to confirm the diagnosis of lymphangitic carcinomatosis before proceeding to a biopsy and stress the value of BAL as the sole procedure when coagulopathy or other contraindication to biopsy is present.

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