Transbronchial Needle Aspiration in the Diagnosis of Bronchogenic Carcinoma

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Transbronchial needle aspiration (TBNA) was performed as a diagnostic procedure in 91 consecutive patients ultimately proven to have bronchogenic carcinoma. Results of TBNA were compared, in the same patients, to the diagnostic yield of cytologic examination of sputum, endobronchial brushings and washings, and endobronchial/transbronchial biopsy; The diagnostic yield for sputum was 13 percent (10 of 75); brushings, 40 percent (34 of 84); washings, 29 percent (26 of 89); biopsy, 56 percent (42 of 75); and TBNA, 45 percent (41 of 91). Aspirates were positive in 35 percent of patients with adenocarcinoma, 41 percent with squamous cell carcinoma, 52 percent with large cell undifferentiated carcinoma, and 55 percent of patients with small cell carcinoma. Carinal aspirates were positive in 54 percent (6 of 11); paratracheal aspirates, 57 percent (13 of 23); para-bronchial aspirates, 39 percent (11 of 28); endobronchial, 78 percent (7 of 9), and peripheral mass or solitary pulmonary nodule, 40 percent (17 of 42). The overall diagnostic yield for brushings, washings, and biopsy was 64 percent. The addition of TBNA increased the yield to 71 percent. Bronchogenic carcinoma was diagnosed solely by TBNA in six patients, all with extrabronchial or extratracheal lesions. We conclude that TBNA increases the diagnostic yield of bronchoscopy, particularly in patients with extratracheal and extrabronchial lesions. An equally important observation is that TBNA fails to contribute significantly to the diagnosis of cancer in patients with lesions readily accessible by conventional bronchoscopic techniques. Exceptions to this observation include occasional patients with necrotic endobronchial tumors, submucosal lesions, and rarely patients with peripheral lung nodules or masses.

A great deal of interest in transbronchial needle aspiration (TBNA) lies in its utility as a staging tool in patients with bronchogenic carcinoma. Most studies have confirmed that TBNA is a relatively sensitive, highly specific method of staging the mediastinum, which may avert the need for surgical staging in certain patients.1-3 TBNA can also be a very effective method to diagnose bronchogenic carcinoma, especially in patients with lesions that are not readily accessible via conventional bronchoscopic techniques.4-10 To better define the role of TBNA in the diagnosis of lung cancer, we prospectively analyzed the yield of TBNA compared to conventional diagnostic techniques in 91 consecutive patients.

METHODS

Consecutive patients with pulmonary lesions on chest roentgenogram consistent with bronchogenic carcinoma underwent fiberoptic bronchoscopy. All patients with small cell carcinoma detected on sputum cytologic examination prior to bronchoscopy were excluded from the study as bronchoscopy was deemed unnecessary. Ninety-one patients were ultimately proven to have lung cancer and comprised the study group. After informed consent was obtained, routine evaluation included cytologic examination of sputum, bronchial washings, and brushings, as well as histologic examination of endobronchial or transbronchial biopsy specimens when indicated. All patients underwent TBNA as a diagnostic procedure. Most patients underwent prebronchoscopic chest CT in an attempt to localize areas of mediastinal adenopathy, defined as any node greater than 1 cm in diameter in the short axis. TBNA was then directed by chest CT in areas suspicious for mediastinal adenopathy. Fluoroscopy was utilized only in patients who underwent TBNA of peripheral nodules or masses. Each patient underwent fiberoptic bronchoscopy utilizing an Olympus BF-4B2 bronchoscope. Bronchoscopy was performed by staff pulmonologists or pulmonary fellows under staff supervision. In patients with mediastinal adenopathy, TBNA was performed prior to brushings, washings, and biopsies to avoid contaminating the trachea with cellular material from the more distal airways. Three to five aspirates were obtained utilizing a separate Wang type 1 or 2 needle for each anatomic site within the trachea or bronchus that corresponded with mediastinal adenopathy or a peribronchial lesion on chest CT. TBNA of peripheral lesions was not attempted if the lesion could not be approached within 1 cm by either biopsy forceps or brush. Cytology specimens were collected and labeled separately. Brushings, washings, and biopsies were subsequently performed as indicated by tumor location and accessibility. Chest roentgenograms were obtained within two hours after the procedure. All patients, with the exception of those diagnosed by bronchoscopy as having small cell carcinoma, subsequently underwent surgical mediastinal exploration to confirm the results of TBNA if mediastinal adenopathy was noted on CT scanning.

The diagnostic yield for each technique was evaluated. TBNA was further evaluated for diagnostic yield related to anatomic site of aspiration as well as histopathologic subset of bronchogenic carcinoma. Finally, the overall diagnostic yield of conventional techniques of fiberoptic bronchoscopy was compared to the yield of bronchoscopy with the addition of TBNA. Patients who underwent nondiagnostic bronchoscopy subsequently were diagnosed by either percutaneous fine needle aspiration, thoracotomy, or surgical mediastinal exploration.

CHEST / 92 / 1 / JULY, 1987 83
Table 1—Histologic Subsets

<table>
<thead>
<tr>
<th>Patients (%)</th>
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<tbody>
<tr>
<td>Adenocarcinoma</td>
<td>31</td>
</tr>
<tr>
<td>Squamous cell</td>
<td>17</td>
</tr>
<tr>
<td>Large cell undiff</td>
<td>21</td>
</tr>
<tr>
<td>Small cell</td>
<td>22</td>
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<tr>
<td>Total</td>
<td>91</td>
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RESULTS

Ninety-one consecutive patients with bronchogenic carcinoma were prospectively evaluated. The histologic subsets of our patient population are reflected in Table 1. Adenocarcinoma comprised 34 percent of our patient population with squamous cell carcinoma, large cell undifferentiated carcinoma, and small cell carcinoma accounting for 19, 23, and 24 percent, respectively.

The diagnostic yield for sputum cytologic examination was 13 percent. For bronchial brushings, washings, and transbronchial/endobronchial biopsy, the yields were 40, 29, and 56 percent, respectively. TBNA demonstrated a malignant diagnosis in 45 percent of the patients (Table 2).

As it relates to histologic subset, the diagnostic yield for TBNA is reflected in Table 3. Adenocarcinoma was associated with a malignant TBNA 35 percent of the time, squamous cell CA 41 percent, large cell undifferentiated carcinoma 52 percent, and small cell carcinoma 55 percent.

Aspirates from the carina in patients with subcarinal malignant lesions were positive in 54 percent of the cases; paratracheal aspirates, 57 percent; parabronchial aspirates, 39 percent; endobronchial aspirates, 76 percent; and peripheral mass or solitary pulmonary nodule, 40 percent (Table 4). TBNA alone confirmed a malignant diagnosis in six patients, three patients with small cell carcinoma, two with adenocarcinoma, and one patient with squamous cell carcinoma. All six lesions were extratracheal or extrabronchial. No patient with lesions accessible by conventional bronchoscopic techniques was diagnosed solely by TBNA. Transbronchial/endobronchial biopsies were solely diagnostic in eight patients, washings in two, and brushings in only one patient. The overall diagnostic yield for bronchoscopy utilizing the conventional techniques of washings, brushings, and biopsy was 64 percent (59 of 91). With the addition of TBNA, the overall diagnostic yield of bronchoscopy in our population of patients with bronchogenic carcinoma was 71 percent (65 of 91). There were no false positive aspirates detected. No patient suffered significant complication (pneumothorax or hemorrhage) from bronchoscopy.

DISCUSSION

The role of transbronchial needle aspiration (TBNA) in the assessment of patients with bronchogenic carcinoma is currently being defined. As a staging tool, CT-directed TBNA has been shown to be a relatively sensitive, highly specific method of assessing mediastinal spread of the primary lung carcinoma. Results previously reported by us reflect a sensitivity of 50 percent and specificity of 96 percent when TBNA is used as a staging tool. Its usefulness as a diagnostic tool has been less well-defined.

Our diagnostic yield for conventional techniques utilized in the assessment of patients with bronchogenic carcinoma compares favorably with previous studies. As expected, sputum cytology offered the lowest diagnostic yield (13 percent) while transbronchial/endobronchial biopsy afforded the highest yield (56 percent). TBNA was next highest in yield at 45 percent. The overall diagnostic yield of bronchoscopy utilizing the conventional techniques of bronchial washings, brushings, and biopsy was 64 percent. With the addition of TBNA, bronchoscopy was diagnostic in 71 percent of the cases. There were six patients with extratracheal/extrabronchial lesions in whom TBNA alone confirmed malignancy. These results are comparable to those of Shure and Fedullo who noted a diagnostic yield with biopsy, brushings, and washings of 48 percent. With the addition of TBNA, the diagnostic yield increased to 69 percent. Our diagnostic yield of TBNA (45 percent) is similar to that of Harrow et al, who, in studying 70 patients with lung carcinoma, noted a malignant aspirate via TBNA in 32 (46 percent).

The yield of TBNA was highest in patients with small cell carcinoma and lowest in patients with adenocar-
cinoma (Table 3). This difference may be related to three factors. First, small cell carcinoma typically presents as a large central lesion with submucosal spread, thereby affording easier accessibility via TBNA while adenocarcinoma usually manifests as a smaller, peripheral parenchymal lesion. Second, small cell carcinomas have more cells per unit volume than adenocarcinomas. Finally, the individual cells of small cell carcinomas are less adherent to one another than those of adenocarcinoma. Our results again compare favorably to Harrow et al. who noted a higher yield with small cell carcinoma (73 percent) when compared to adenocarcinoma (39 percent).

The utility of TBNA as a diagnostic tool in patients with bronchogenic carcinoma is best illustrated by the results of TBNA compared to the anatomic site of tumor involvement. The yield was lowest (40 percent) in patients with peripheral masses or nodules. TBNA was not attempted unless the lesion could be approached within 1 cm by either biopsy forceps or brush. As could be expected, the yield of TBNA for endobronchial lesions was highest at 78 percent. An important finding in our study relates to the yield of CT-directed TBNA from the subcarinal, paratracheal, and parabronchial areas, regions inaccessible via conventional bronchoscopy. The diagnostic yield of carinal aspirates was 54 percent; paratracheal aspirates, 57 percent; and parabronchial aspirates, 39 percent.

Our study again demonstrates the safety of TBNA. No patient suffered any significant complication. The study confirms the value of TBNA as a diagnostic tool in selected patients with bronchogenic carcinoma. TBNA is best utilized in patients with extratracheal or extrabronchial lesions not readily accessible by conventional bronchoscopic techniques. TBNA does not appear to aid in the diagnosis of tumors found within the airways. The exceptions are selected patients with necrotic, submucosal, or peripheral nodules/masses.

REFERENCES
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CHEST / 92 / 1 / JULY, 1987 85