ORIGINAL ARTICLE

Transbronchial Needle Aspiration (TBNA) in the Early Diagnosis and Staging of Bronchogenic Carcinoma

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ABSTRACT

Background. Transbronchial needle aspiration (TBNA) has evolved as a useful technique to establish diagnosis in patients suspected of having bronchogenic carcinoma.

Methods. Transbronchial needle aspiration (TBNA) was done in twenty-five patients with either proved or suspected bronchogenic carcinoma using a flexible bronchoscope. Results of 19 patients who had pulmonary malignancy were analysed.

Results. In the 12 patients with endobronchially visible abnormality, TBNA could correctly identify eleven patients with carcinoma and one patient, who was a treated case, with no evidence of residual disease. In the seven patients with bronchoscopically invisible extrabronchial disease, TBNA could identify four patients with malignancy and also characterize true negative disease in a treated case with subcarinal lymph node. TBNA could define the correct cytology in all the patients with visible tumours and in 59% of patients with bronchoscopically invisible tumours. The procedure was diagnostic in 84% of the cases. Mediastinal lymph node sampling in nine patients by TBNA, with the help of contrast enhanced CT scans, was positive in five patients and negative in the other four patients thus helping in nodal staging.

Conclusions. Although the sample size of the study was small, the procedure was found to be very useful for the early diagnosis and staging of bronchogenic carcinoma. It was safe, well tolerated and no untoward complications were observed.

Key words: Transbronchial needle aspiration, Bronchoscopy, Bronchogenic carcinoma.

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INTRODUCTION

Bronchogenic carcinoma is the commonest cause of cancer mortality in the western society and its incidence continues to rise. Bronchoscopy has proved to be the most useful diagnostic tool in the initial evaluation of patients with bronchogenic carcinomas. Most patients who present with bronchogenic carcinoma have mediastinal extension of the tumour and/or metastatic disease, thus making them unfit for surgical management. In the few patients who can get long-term benefits with surgery, it is essential to do precise pathological staging.

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before surgical expiration is attempted. Accurate mediastinal staging is imperative prognostically as survival rates are inversely related to the presence or absence of malignant mediastinal adenopathy. Although bronchoscopy has been useful in the early diagnosis of endobronchially visible tumours, it has limitations in diagnosing extrabronchial disease and malignant mediastinal lymphadenopathy. For many years, the standard for mediastinal staging of bronchogenic carcinoma has been surgical procedures, like mediastinoscopy, or mediastinototomy which are costly, require hospitalization and general anaesthesia. Imaging techniques, like CT scan and MRI are sensitive in detecting lymph nodes even less than 1 cm in size but they are not specific. The technique of TBNA was developed in the early eighties to obtain cytological and histological samples from the hilar or mediastinal lesions with flexible transbronchial needles introduced through the tracheal or the bronchial wall. The procedure is safe, inexpensive and can be performed easily during a routine diagnostic bronchoscopy, obviating the need for another surgical procedure for staging.

The first descriptions of sampling mediastinal lymph nodes through the tracheal carina using a rigid bronchoscope was by Schieppati in 1949. The usefulness of TBNA to provide a diagnosis even in the absence of an endobronchial lesion was reported subsequently by other workers. It was only in 1983 that Wang and Terry first described the procedure of TBNA for mediastinal lymph node sampling using the flexible bronchoscope. Later publications have highlighted the utility of this procedure in the diagnosis of endobronchial and peripheral lesions, even in the absence of endobronchial disease. We report our experience.

MATERIAL AND METHODS

Twenty-five patients with either proved or suspected bronchogenic carcinoma were evaluated prospectively by TBNA between the period 2nd May to 1st June 2000 at the Thoracic Endoscopy Service, Azienda Ospedaliera "Umberto 1", 60020 Ancona, Italy. All the patients had a standard chest radiograph to determine the location of the tumour mass. CT scans were available in most patients which helped in defining the mediastinal lymph nodes. Mediastinal and hilar lymph nodes were sampled by TBNA on the basis of the classification as proposed by Wang: I - anterior carina; II - posterior carina; III - right paratracheal; IV - left paratracheal (aorto-pulmonary window); V - right main bronchus; VI - left main bronchus; VII - right upper hilar, VIII - sub carinal; IX - right lower hilar; X - sub-sub carinal; XI - left hilar). In patients with lung nodules or masses without mediastinal and hilar abnormality, TBNA and other sampling techniques such as forceps biopsy were performed at the lung lesion with or without fluoroscopic guidance. Flexible bronchoscopy with TBNA was conducted by standard techniques. No sedation or pre-medication was given to any of the patients. Care was taken to perform TBNA before any distal airway examination or specimen collection to avoid false positive results. TBNA was performed with either the 21G cytology needles (MAJ 65 for NA-1C-1) by Olympus Corp., 22G cytology needles (MW-122) or 19G histology needles (MW-319) by Mill Rose Laboratories, Mentor, OH, USA. To prevent damage to the working channel of the bronchoscope by the needle, the insertion tube was kept as straight as possible with the distal tip in the neutral position during catheter insertion. The bevelled end of the needle was secured within the metal hub during its passage through the working channel. The needle was advanced and locked in place only after the metal hub was visible beyond the tip of the bronchoscope. The bronchoscope was then advanced to the target area and the tip of the needle was anchored in the intercartilaginous space in an attempt to penetrate the airway wall as perpendicularly as possible. The needles were inserted with either the pushing or jabbing techniques. With the needle inserted suction was applied at the proximal port using a 20-ml syringe. Aspiration of blood indicated inadvertent penetration of a major intrathoracic...
vessel and in such situations suction was released and needle was retracted, and a new site was selected for aspiration. When there was no blood in the aspirate, the catheter was agitated to and fro with continuous suction, in an attempt to shear off cells from the mass or lymph node. The needle was withdrawn from the target site after releasing suction. The tip of the bronchoscope was straightened and the needle assembly was pulled out of the bronchoscope in a single, smooth motion. Sampling of the peripheral lesions was performed by placing the metal hub of the needle against the lesion under fluoroscopic guidance as previously described\textsuperscript{18}, before pushing the needle into the lesion. Sampling of the endobronchial lesions was performed by embedding the needle in the lesion, the metal hub kept parallel to the airway wall, and agitated to and fro repeatedly with continuous suction. The specimen for cytology was prepared by using air from the 20-ml syringe to blow the specimen onto the slide (smear technique\textsuperscript{19}) before smearing it with another slide and immediately placing it in 95% alcohol. The clinical information, radiological findings and test results of each procedure were analysed to assess the utility of TBNA in the early diagnosis and staging of bronchogenic carcinoma.

RESULTS

Of the twenty-five patients subjected to TBNA, results of only 19 patients (age range 58–78 years and mean age 66 years), who had pulmonary malignancy were analysed. The other six patients had non-malignant pulmonary diseases. Fifteen patients (79%) were males and only four patients (21%) were females. The average duration of symptoms at the time of presentation for evaluation was 1.8 months. The symptoms at the time of presentation and the clinical signs were unremarkable. The average smoking history was of 51.3 pack years. Radiologically, pulmonary mass like opacities were seen with a right sided preponderance in 11 patients (58%), left sided in seven patients (37%) and a normal skiagram in one patient. CT scans were available in 17 patients. These could define mediastinal lymph nodes in nine patients that facilitated TBNA through these lymph node sites and also defined mass lesions in five other patients who had extrabronchial disease not visible by bronchoscopy.

Bronchoscopically, twelve patients had a visible endobronchial abnormality. TBNA and bronchial biopsies were performed directly from the diseased areas in these patients. While TBNA identified 11 patients with atypical cells suggestive of malignancy, bronchial biopsies could diagnose malignancy in 10 out of these 11 patients. In one treated case of lung cancer, both TBNA and biopsies correctly defined only chronic inflammation (True negative) (see Table). In seven out of these 12 patients, mediastinal lymph nodes sampling by TBNA identified atypical cells in five patients suggesting mediastinal spread and normal lymphocytes in two patients (True negative), thus helping in staging of the disease.

In the seven patients with bronchoscopically invisible extrabronchial or peripheral disease, TBNA with the help of contrast enhanced CT scans could identify four patients with malignancy. In one of these four patients, TBNA done under fluoroscopic guidance diagnosed the disease while transbronchial pulmonary biopsy in the same setting was inconclusive. No diagnosis could be obtained by TBNA in two patients and in one patient with a positive subcarinal lymph node who had received six cycles of chemotherapy, the aspirate yielded normal lymphocytes suggesting a true negative result. In another patient, mediastinal lymph node

<table>
<thead>
<tr>
<th>Type of Patients</th>
<th>Total Patients</th>
<th>TBNA Positive</th>
<th>Br. Bx. Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>New cases</td>
<td>11</td>
<td>11 (True positive)</td>
<td>10 (True positive)</td>
</tr>
<tr>
<td>Treated cases</td>
<td>1</td>
<td>1 (True negative)</td>
<td>1 (True negative)</td>
</tr>
<tr>
<td>Yield of the procedures</td>
<td></td>
<td>12 (100%)</td>
<td>11 (90%)</td>
</tr>
</tbody>
</table>

Table. Comparison of yield of TBNA and bronchial punch biopsies in visible endobronchial tumours
aspiration by TBNA with the help of contrast enhanced CT scan was negative.

Besides minor self limiting bleeding following TBNA, no other complications were observed following the procedure which was tolerated well by the patients.

**DISCUSSION**

Bronchogenic carcinoma has become a leading cause of cancer mortality. While surgical excision remains the best hope for cure, appropriate pathological staging is essential before planning surgery as most patients have mediastinal extension or distant metastatic disease at the time of initial diagnosis.

CT scans of the chest have been extremely valuable not only in the evaluation of the extent of parenchymal disease, but also in identifying mediastinal and hilar lymphadenopathy. Although the sensitivity of this radiographic technique is high, the specificity is low\(^2\)-\(^4\). Surgical biopsy methods on the contrary provide good sensitivity and specificity with limited risk of morbidity and mortality\(^20\) but are costly.

Since the mid-1980s, the technique of transbronchial needle aspiration (TBNA) has been developed to obtain cytological or histological material from the hilar and mediastinal lesions with the flexible transbronchial needles introduced through the tracheal or bronchial wall during a bronchoscopy. The effectiveness of TBNA in the diagnosis and staging of lung cancer has been well documented\(^5\)-\(^10\). Gupta *et al* from India have also reported the utility of TBNA in the diagnosis of peripheral nodules under fluoroscopic guidance, however, they did not find any advantage of TBNA in the diagnosis of endobronchial lesions over the conventional methods except in selected patients with necrotic, vascular or submucosal lesions\(^21\)-\(^22\).

In this study an attempt was made to understand the utility of TBNA in the early diagnosis and staging of bronchogenic carcinoma. The procedure was diagnostic in all the patients with central or endobronchially visible tumours and in 59% of patients with invisible extrabronchial or peripheral tumours. No significant difference in the diagnostic yield was seen between TBNA and bronchial punch biopsies in the endobronchially visible tumours as has been reported by Gupta *et al*\(^22\). TBNA clearly was superior to bronchial punch biopsies in the endobronchially invisible disease when done with the help of contrast enhanced CT scans. From the CT scan identified mediastinal lymph nodes in nine patients, TBNA identified five patients with positive lymph nodes and the other four with negative cytology suggesting that the latter patients had only reactive lymph nodes. The procedure, thus, helped not only in staging of the disease in these patients but also obviated the need for further invasive procedures like mediastinoscopy or mediastinotomy for staging. The procedure was safe without any untoward complications.

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**REFERENCES**


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