Endoscopic Ultrasound: Indian Perspective

Agam Vora

Mediastinoscopy is a minimally invasive surgical procedure that allows visualization and tissue sampling of mediastinal nodes. Mediastinoscopy has been extremely valuable in the evaluation and staging of lung cancer and therefore has been considered the gold standard for this purpose for over 30 years. Historically, this procedure has been associated with a low morbidity and mortality and a high sensitivity for diagnosing lung cancer with certain procedural limitations. Recently, it has been reported that not only is mediastinoscopy use limited in community practice, concomitant biopsy rates are limited as well.1

While mediastinoscopy does provide a tissue diagnosis, the procedure has its limitations. Cervical mediastinoscopy allows access to nodal stations 2, 3, 4 and 7, leaving out commonly involved pulmonary ligament and aortopulmonary window nodes.1 It requires general anesthesia and has a morbidity of 1% and a mortality of 0.2%. The procedure adds considerable expense to the staging workup. The estimated current cost is $1,700 for the procedure alone and $7,500 for a mediastinoscopy with a 2-day hospital stay. This prompted the development of endobronchial ultrasound (EBUS) in the 1990s.2

History of EBUS

Computerised tomography (CT) scan was and continues to be the imaging modality of choice for diagnosis and staging of lung cancer and other lung diseases. However CT proved unsuccessful in evaluation of lymph node involvement and for diagnosis of air wall infiltration. Positron emission tomography-CT (PET-CT) to a certain extent improved the mediastinal lymph node staging. However to obtain tissue for histopathology, mediastinoscopy or thoracotomy is needed. A better imaging modality was increasingly felt necessary for lung cancer staging. In the late 1980s endoscopic ultrasound (EUS) was introduced in gastroenterology. However the same could not be used for all mediastinal structures due to interference of air, since air cannot conduct ultrasound waves. After years of painful research it was in 1990s that a dedicated endobronchial ultrasound system (EBUS) with balloon catheter was made commercially available. EBUS is becoming an essential bronchoscopic tool. With the recent introduction of dedicated ultrasonic bronchoscope with real-time guidance for needle aspiration there is widespread acceptance of this novel method leading to a ‘new dawn for respiratory physician’.3

Types of EBUS

EBUS combines an endoscopic image with an ultrasound probe giving sonographic images through the airway wall.4 There are two forms of EBUS, radial and linear (convex) (Table 1). Both these forms have a transducer and a processor. Radial probe EBUS was first developed and then subsequently linear probe EBUS. Transducer produces and receives the sound waves. Processor integrates the reflected sound waves.5

Advantages and Limitations of EBUS

Advantages of EBUS-guided transbronchial needle aspiration (EBUS-TBNA) compared to conventional transbronchial needle aspiration (TBNA) and mediastinoscopy are listed in Table 2.4

Limitations of EBUS

Compared to conventional TBNA

The cost of equipment and additional staff time required in
Table 2: Advantages of EBUS guided TBNA

<table>
<thead>
<tr>
<th>Advantages over conventional TBNA</th>
<th>Advantages over mediastinoscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct visualisation of node</td>
<td>Minimally invasive</td>
</tr>
<tr>
<td>Superior sensitivity</td>
<td>Minimally invasive</td>
</tr>
<tr>
<td>Real-time sensitivity</td>
<td>Minimally invasive</td>
</tr>
<tr>
<td>Access to hilar nodes</td>
<td>Minimally invasive</td>
</tr>
<tr>
<td>More robust EBUS-TBNA needle</td>
<td>Minimally invasive</td>
</tr>
<tr>
<td>Cost saving: not in theatre, outpatient</td>
<td>More robust EBUS-TBNA needle</td>
</tr>
<tr>
<td>Cost saving: not in theatre, outpatient</td>
<td>More robust EBUS-TBNA needle</td>
</tr>
<tr>
<td>Damage to bronchi</td>
<td>Can be performed by trained respiratory physicians</td>
</tr>
<tr>
<td>Better access to remote nodal stations</td>
<td>Can be performed by trained respiratory physicians</td>
</tr>
</tbody>
</table>

EBUS: Endoscopic bronchial ultrasound; TBNA: Transbronchial needle aspiration

Table 3: Relative diagnostic utility of mediastinal staging investigations based on data from systematic reviews and meta-analyses.

<table>
<thead>
<tr>
<th>Technique</th>
<th>Sensitivity</th>
<th>Negative-predictive value</th>
<th>Prevalence (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical mediastinoscopy</td>
<td>78-81</td>
<td>91</td>
<td>39 (15-71)</td>
</tr>
<tr>
<td>Conventional TBNA</td>
<td>76-78</td>
<td>71-72</td>
<td>75 (30-100)</td>
</tr>
<tr>
<td>EBUS-TBNA</td>
<td>88-93</td>
<td>76</td>
<td>68 (17-98)</td>
</tr>
</tbody>
</table>

All figures in percentage

Contraindications for EBUS

EBUS-TBNA is well tolerated, but sampling from the mediastinal nodes should not be performed with patients on warfarin (international normalized ratio (INR) should be <1.4 ideally) or clopidogrel (both should be stopped for a week before the procedure), or known coagulation or platelet function disorders because of bleeding risk in the mediastinum.

EBUS-TBNA should be postponed for at least six weeks after myocardial infarction and is contraindicated in the presence of ongoing myocardial ischemia, arrhythmias or severe hypoxemia at rest.

EBUS-TBNA is usually clinically not appropriate if lymphoma is a likely possibility.

Anesthesia and Technique

EBUS is usually performed under procedural sedation and local anesthesia. However, it is sometimes preferable that the procedure takes place under conscious sedation or general anesthesia, both of which allow better tolerance and control, with less cough and movement during image collection and puncture, a

Complications of EBUS

EBUS and EBUS-TBNA are usually safe procedures. No serious complications were found on a systematic review of effectiveness and safety of CP-EBUS-TBNA of regional lymph nodes. A study by Asano et al, reported that complication rate was 1.23%, with hemorrhage being the most frequent complication. Infectious complications developed in 0.19% of cases. Pneumothorax developed in two cases. Mediastinal abscess has been reported as a case report.

Indian Experience

In a study by Mohan et al., involving 191 patients who underwent EBUS for the evaluation of pulmonary/mediastinal lesions it was found that EBUS-TBNA has a high diagnostic yield for mediastinal lesions, both benign and malignant. The diagnostic yield of EBUS for malignant disorders was 70.7% (95% confidence interval (CI), 0.86, 0.77). The overall ability of EBUS to achieve a definitive diagnosis (benign plus malignant) was 90.1% (95% CI, 0.85, 0.94).

The study of mediastinal Lymphadenopathy in India through the eyes of EBUS by Dhamija and his team is presented in this issue. They have done excellent work and have presented their data of 300 patients. It talks about the common etiology of benign lymph node in our country as granulomatous disorder (like tuberculosis and sarcoid). This particular modality of investigation can help treating physician diagnose malignancy early which may otherwise be treated as tuberculosis before it gets diagnose otherwise.
References


