The Role of Bronchoscopy and the Diagnosis and Staging of Lung Cancer

Pallav L. Shah

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10.1 Introduction

Bronchoscopy is one of the key investigations in the diagnosis and staging of patients with suspected lung cancer. It should be utilized in conjunction with a clinical assessment and radiological evaluation of the patient. The symptoms and signs that should prompt further assessment are listed in Table 10.1. We advocate a low threshold for performing a chest radiograph in patients with clinical features suspicious of neoplasia, and computed tomography (CT) of the thorax and abdomen in patients with a significant suspicion of lung cancer. Bronchoscopy compliments the assessment of these patients and allows visual examination of the vocal cords, trachea, and endobronchial tree down to the subsegmental level. Specimens can also be obtained during flexible bronchoscopy.

10.2 Equipment

The flexible bronchoscope consists of a flexible tube, the distal end of which can be angulated through 160° by a lever at the head of the scope. There are bundles of fibers within the tube that carry light to the distal end, illuminating the airways, and a further bundle to transmit the image to the eyepiece. There is also an instrument channel that allows procedures such as biopsy sampling to be performed. This channel also functions as a suction channel. A variety of instruments are available with different-sized instrument channels and various external diameters. These characteristics influence the use of the bronchoscope; for example, bronchoscopes with larger instrument channels are more suitable for interventional procedures. Videobronchoscopes are also becoming more widespread; these have a charged couple device (CCD chip) at the distal end, which allows the image to be projected onto a monitor. The latest system utilizes high-definition TV technology and produces high-quality, full-screen images, which significantly enhance diagnosis.

10.3 Patient Preparation and Procedure

Flexible bronchoscopy is usually performed with or without conscious sedation as an outpatient procedure. Verbal and written instructions should be given to the patients. They should be specifically advised not to eat or drink for at least 4 h before the procedure. Patients who are sedated should have an escort to accompany them home and ide-
ally have supervision for a 24-h period. Appropriate radiology (chest radiographs and ideally CT of the thorax) should be available for review prior to the procedure. A full blood count and coagulation study should be performed on all patients being considered for a transbronchial lung biopsy procedure. Arterial blood gases and spirometry should be performed if the patient is dyspneic and oxygen saturations are less than 95% on air, or if hypercapnea is suspected (Table 10.2). During the procedure, arterial oxygenation is monitored by pulse oximetry and patients are given supplemental oxygen to maintain oxygen saturations above 90%. Continuous ECG monitoring should be performed in all patients with a history of cardiac disease or where the hypoxia cannot be corrected.

### Table 10.2. Preparation for bronchoscopy

- Patient information; verbal and written
- Informed consent
- Full blood count and clotting prior to transbronchial lung biopsy
- Baseline ECG if history of cardiac disease
- Spirometry if oxygen saturations less than 95%
- Arterial blood gases if oxygen saturation less than 95%
- Intravenous access
- Consider bronchodilators if evidence of bronchospasm
- Prophylactic antibiotics if asplenia, heart valve prosthesis, cardiac murmur, or history of endocarditis

#### 10.4 Diagnosis of Lung Cancer

##### 10.4.1 Central Lesions

Flexible bronchoscopy enables visual inspection and biopsy sampling from the main airways down to the segmental levels for diagnostic purposes. The external diameter of the bronchoscope determines the size of the airways that can be reached. The endobronchial appearance of bronchial neoplasia ranges from exophytic polypoid lesions through to subtle mucosal irregularities (Fig. 10.1). In submucosal disease there may be thickening of the airway and changes in the mucosal folds. Tumor masses and enlarged lymph nodes may also lead to extrinsic compression of the airway.

Where an exophytic lesion is visible, pathological confirmation should be achieved in over 90% of patients. A combination of techniques can be used to obtain samples for diagnosis. Bronchial washing involves the instillation of 20-ml aliquots of normal saline around the site of the abnormality. The success rates associated with bronchial washing alone is around 31–50% [1, 2]. Biopsy forceps can be inserted through the instrument channel of the bronchoscope and pinch biopsies obtained under direct vision. Several biopsy specimens should be obtained in order to ensure that adequate tissue has been obtained for diagnosis. A cytology brush can also be used to scrape some cells from the surface of any abnormal areas. For submucosal lesions, a transbronchial fine needle can also be inserted through the mucosa into the lesion and a few cells aspirated for a cytological analysis [3].

A recent review evaluated 30 studies where the yield from the different bronchoscopic techniques was evaluated in at least 50 patients with suspected lung cancer [4]. The sensitivity from cytological techniques such as bronchial washing was 48% (range 21–76%), that from bronchial brushing was 59% (range 23–93%), and that from endobronchial fine-needle aspiration of mucosal lesions was around 56% (range 23–90%). A higher yield was obtained from endobronchial biopsy procedures, with an overall sensitivity of 74% (range 4–97%). The collective sensitivity when all the modalities are used is 88% (range 67–97%) for central lesions that are visible at bronchoscopy.

Bronchial biopsy specimens can either be first rinsed in saline or rolled onto a glass slide in order to further increase the diagnostic yield. The latter is known as imprint cytology, where any loose cells from the biopsy specimen are fixed onto a glass slide and may allow cytological analysis [5]. However, this technique may damage the biopsy specimen and impair its histological

![Fig. 10.1. Videobronchoscopy appearance of normal endobronchial airway at the segmental level (A), a polypoid exophytic tumor (B), and a submucosal lesion (C)](image-url)