Introduction
Bronchoscopy became established at the beginning of 20th century after the pioneering work of Jackson & Jackson. Initially this procedure was mainly the province of thoracic surgeons who used it to remove the inhaled foreign bodies. Chest physicians gradually came to appreciate its usefulness and the introduction of flexible fibreoptic bronchoscope has revolutionized the investigation of many diseases affecting the airways of lung and has been extended to provide direct access to the rest of the lungs beyond the airways system. It is probably the most useful advance in the practical investigation of lung disease in the last 25 years. Subsequent technological developments and refinements have come from the Japanese optical industry.

Advantages of Fibreoptic Bronchoscope
When compared to rigid bronchoscope its advantages are numerous. Rigid bronchoscopy involves hospitalization of the patient and has to be performed under general anaesthesia, there by requiring significant preparation and inherent delays. It permits visualization of the proximal parts of airways and is less acceptable to the patient. In contrast, fibreoptic bronchoscopy is an out patient procedure, performed under local anaesthesia and permits greater visualization of not only the distal parts of airways, but also has the range for the biopsy and sampling of the lung tissue itself.

The patient’s acceptance of bronchoscopy will be helped by prior adequate explanation and ideally the bronchoscopist should be involved at the stage of initial planning. The bronchoscopist must always assure himself that:
1. the indications for bronchoscopy are adequate
2. risk factors involved are acceptable
3. the patient understands the investigation and has given written consent
4. the patient is monitored appropriately during the procedure

Indications for Bronchoscopy
1. Haemoptysis: This is a major and frequent indication, but careful history taking and examination will exclude a proportion of patients from further consideration because the
bleeding is clearly not of bronchial origin. It must be stressed that bronchoscopy should not be delayed because the patient is actually bleeding; quite large quantities of blood can be removed with good suction facilities and if the investigation is delayed an opportunity of assessing the true situation or locating the source of bleeding may be lost. Nor should the cessation of bleeding deter the bronchoscopist; otherwise silent, but extensive, pathology may still be found in a large bronchus.

2. Cough and wheeze: Cough of recent onset, unexplained and persistent with or without sputum must always raise the suspicion of a bronchial lesion, a foreign body or bronchial distortion. Wheeze, either as a presenting symptom or found on examination carries a similar significance to cough when it is of recent onset and persistent. Of particular importance is a unilateral wheeze, which will not disappear on coughing or if it does always return to the same place. Such a finding is diagnostic of bronchial narrowing.

3. Aspiration: The possibility of an aspirated foreign body, vomit or blood, particularly in children is another major indication for bronchoscopy. Cough of recent onset associated with choking or after anaesthesia, accident, alcoholic stupor or vomiting is of great clinical significance. In such situations, bronchoscopy is urgent on suspicion; to delay is to risk lung abscess or other dangerous infections.

4. Bronchial obstruction: Certain syndromes, in addition to aspiration, may suggest bronchial obstruction but do not indicate the cause, leaving bronchoscopy as the most useful diagnostic aid. Signs of lung collapse, either segmental, lobar or pulmonary, repeated infections in the same area of lung and pneumonia that does not clear satisfactorily with anti-microbial treatment are the most important syndromes.

5. Post operative pulmonary collapse and infection: This develops in patients who were already producing sputum before any major operation and who find coughing both difficult and painful thereafter. Physiotherapy is frequently inadequate, but bronchial toilet via the fibreoptic bronchoscope produces a dramatic change.

6. A more peripheral shadow suggesting a mass, particularly if persistent, rounded or enlarging should always be considered to represent a tumour until proved otherwise. Patients with such lesion are not commonly considered for bronchoscopy because the causal pathology is expected to be beyond vision. This is, however a dubious argument. Not only the tumour may have grown proximally along a bronchus but much more information can be obtained via the bronchoscope without a view of the presumed tumour itself.


8. For staging of lung cancer.

9. For removal of foreign bodies from tracheo bronchial tree, fibreoptic bronchoscopy is very useful, specially in children. The approach to foreign body has changed in the last few years. It is acute vs. chronic situation rather than adults vs. children. In acute asphyxia, certainly rigid bronchoscopy is the procedure of choice where as in chronic conditions with stable respiratory status, fibreoptic bronchoscope should be used for removal of foreign body.5

Preparation of Patient and Pre-medication
After 3 hours of avoidance of food and drink the procedure is performed under continuous pulse oximetry monitoring. 0.6mg of Atropine intramuscularly is given half an hour before the procedure to reduce the secretions and vasovagal events and 5mg of Diazepam is usually given intramuscularly to reduce the anxiety.

Topical Anaesthesia
10-20ml of 2% xylocaine is sprayed through an atomiser into the nose and mouth and further aliquots of xylocaine are pushed via the channel port of fibrescope, while passing through the vocal cords, trachea and right and left main bronchus.
Manipulation
Insertion of the fibrescope through the nose requires minimal cooperation of the patient and little risk of damage to the instrument. The fibrescope can also be introduced through the rigid bronchoscope. The most common source of pain from the fibrebronchoscope is deformation of the intra-nasal mucosa. This can be minimized by preventing undue sideways movement of the shaft of the bronchoscope if the operator holds it between the index finger and thumb, close to the patient’s nostril.

Nasal insertion of the bronchoscope is the most comfortable for the patient as it does not interfere with swallowing and there is less tendency to gag and vomit. It has the immense advantage that the fibrescope cannot be bitten by the patient. However, unless the operator is experienced and careful, nasal insertion can be painful, as the turbinates and mucosal lining are sensitive. This can be minimized if lateral movements of the fibrescope tip in the nose are minimized by keeping the fibrescope controlled by the left hand.

Insertion through the mouth is used where the nasal passages are too small and it is essential to use a mouth guard to prevent injury to the fibrescope by patient’s teeth. Passing the fibrescope through an endotracheal tube is simple but in the conscious patient it is an uncomfortable procedure. It has been recommended as an essential technique to control haemorrhage and to avoid the effect of wide spread intrapulmonary sepsis.

Special Applications of Bronchoscopy

a. Bronchoalveolar lavage, Protected bronchoalveolar lavage, Protected specimen brush, Plugged telescoping catheter
   The common denominator in all attempts to improve the microbiologic diagnosis of severe nosocomial pneumonia involves recruitment of lower respiratory tract secretions and quantitative cultures of the secretions thus obtained. Quantitative cultures are important to distinguish the inevitable low level contamination of passing through either the upper airways or the endotracheal tube. The most extensively studied techniques have been bronchoscopy with bronchoalveolar lavage and Protected Specimen Brush (PSB). The techniques of performing each have been standardized. Variants of these two techniques include single sheathed brushes, protected BAL (PROBAL) and Mini-BAL through a sheathed catheter.

b. Transbronchial lung biopsy
   Transbronchial lung biopsy is an accepted routine procedure in patient with diffuse pulmonary shadowing where the diagnosis has not been obtained by other clinical means.

c. Transbronchial needle aspiration
   Transbronchial needle aspiration has been found to be of great clinical value in staging of lung cancer.

d. Nd: Yag laser bronchoscopy
   It is useful in relieving the endobronchial obstruction; is a palliative procedure of great clinical value in impending respiratory failure helps in preparing the airway for insertion of airways stent.

e. Airways stents
   Endobronchial stenting in respiratory failure caused by central obstructive lesions has been a major advance in the last one decade.
Recent Advances

a. Photodynamic therapy
Fluorescence fibreoptic bronchoscopy has been used to localize small tumours not visible on a chest radiograph. This method is based on the activation of photosensitive material, haematoporphyrin by ultraviolet light. Haematoporphyrin is taken up preferentially by malignant tissue, which then becomes identifiable under ultraviolet illumination. In addition to its diagnostic aspects this substance undergoes a photodynamic reaction on exposure to light which results in cell lysis.

b. Argon plasma coagulation (APC)
Argon plasma coagulation (APC) is a form of non-contact electrocoagulation; offers simplicity and low cost of an electrocoagulator. The non-contact feature of APC allows rapid coagulation with minimal manipulation and mechanical trauma to the target tissue through the fibreoptic bronchoscope.

c. Endobronchial electrocautery through flexible bronchoscopy
It can be used safely as an ablative procedure with comparable success rates to Nd: Yag laser.

d. Endobronchial cryotherapy
The exible cryoprobe when used through a flexible bronchoscope is safe and effective in management of tracheobronchial obstruction. It offers inexpensive, easy to use, less complication and safe alternative to Nd: Yag laser therapy.

e. Microsampling of pulmonary epithelial lining fluid
A minimally invasive and quantitative bronchoscopic microsampling probe has been developed to measure the concentrations of inflammatory mediators and other chemicals in pulmonary epithelial lining fluid (ELF). The procedure is simple and can be done without the administration of saline solution in to the lungs. The procedure allows serial microsampling in patients with severe respiratory failure that precludes saline solution administration.

f. High magnification bronchovideoscopy combined with narrow band imaging
High magnification bronchoscopy combined with narrow band imaging (NBI) has been useful in the detection of capillary blood vessels in angiogenic squamous dysplasia (ASD) lesions at sites of abnormal fluorescence. This may enable the discrimination between angiogenic squamous dysplasia (ASD) and other pre-invasive bronchial lesion.

Summary
Flexible bronchoscopy is an expensive, challenging and time-consuming procedure that poses some discomfort for the patient. The bronchoscopist’s goal is to avoid a nondiagnostic bronchoscopy and avoid repeating the procedure. The bronchoscopist must use every possible tool (transbronchial biopsy, transbronchial needle aspiration and so on) to accomplish the desired goals.

References

Further Reading