

Fiberoptic bronchoscopy: roles in diagnostic and therapeutic interventions

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Abbreviations: FOB, fiberoptic bronchoscopy; EBUS, endobronchial ultrasonography; ENB, electromagnetic navigational bronchoscopy; PPL, peripheral pulmonary lesions; RB, rigid bronchoscopies; BAL, bronchoalveolar lavage; TBNA, transbronchial needle aspiration; EBBT, Endobronchial radiation therapy; PDT, Photodynamic therapy

Editorial

The first bronchoscopy was performed by Gustav Killian of Freiburg of Germany in 1887, whereas fiberoptic bronchoscopy (FOB) was developed by Shigeto Ikeda in 1966 with technological advancement, the development of endobronchial ultrasonography (EBUS) and electromagnetic navigational bronchoscopy (ENB) have contributed to examination and biopsy of the mediastinal and peripheral pulmonary lesions (PPL). Chevalier Jackson, the father of the American Broncho-Esophagology Association designed modern rigid bronchoscopies (RB) with primary indication of therapeutic, such as dilatation of strictures from tuberculosis and diphtheria and removal of foreign bodies. FOB with minimal sedation requirement is convenient to operate, safe and well tolerated by both out- and inpatients. FOB has almost completely replaced RB in the initial assessment of respiratory diseases and disorders. Flexible bronchoscopes, generally come in three size categories (pediatric/ ultrathin scopes: outer diameter of 2.8 mm. and working channel width of 1.2 mm; adult scopes : outer diameter of 4.9-5.5 mm. and working channel size of 2.0 mm.; and therapeutic scopes : outer diameter of 6.0-6.2 mm. and working channel size of 2.8-3.2 mm.) FOB allows inspecting the details of mucosal color and vascularity of the majority of the fourth-order and frequently up to the sixth-order bronchi. FOB has complication rate (such as hemorrhage and pneumothorax related to the used biopsy procedure, etc.) of 0.12 % and a mortality rate of 0.04 % (0-0.02 %-outpatient procedure). Both FOB and RB can cause temporary increase in airflow obstruction with hypercapnia. FOB provides the highest diagnostic yield of more than 90 % in the central endobronchial lesions. FOB biopsy can achieve the diagnostic accuracy by taking between 3 and 5 biopsy specimens, whereas a combination of bronchial brushing, biopsy and bronchial washes can achieve the diagnostic accuracy of more than 60 % of cases with suspected lung cancer. The role of FOB bronchoalveolar lavage (BAL) in diagnosis of primary lung cancer, but the complications of bleeding and pneumothorax are uncommon.

Both FOB and RB can cause both medication-related complications (an overdose of local anesthetics-induced central nervous system toxicity like seizures, neuropathy, and coma, methemoglobinemia, pulmonary insufficiency, hemodynamic adverse effects, malignant hyperthermia, and prolonged neuromuscular paralysis from general anesthetics, etc.) and procedure-related complications (bleeding (0.12 %-outpatient procedure), pneumothorax (1-3% of cases, 0.1-0.16%-outpatient procedure)), cardiac arrhythmias, other complications (hypoxia/hypoxemia, hypercapnia, sedation, aspiration, pneumomediastinum, trauma to the vocal cord,

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oropharynx, nasopharynx), etc. Other mechanical complications include laryngospasm, bronchospasm, atelectasis, elevated airway pressures, and infection. EBUS-transbronchial needle aspiration (TBNA) for lymph node staging has currently been available for more than 13 years. RB has advantages in certain situations regarding more accurate information of endobronchial location of a tumor before resection. The use of laser (Light Amplification of Stimulated Emission of Radiation) bronchoscope by using its thermal and photochemical effects has been increasingly accepted over the past 35 years for treatment of endobronchial disorders or lesions. Medical laser machines incorporate a red light producing helium-neon laser to act as aiming light wave that travel in phase with each other (coherence), in a single direction without divergence (collimation) and represent a single wavelength (monochromatic). The application of lasers in respiratory medicine are: thermal effects(photoresection of airway lesions, malignant lesions, benign lesions, photocoagulation), management of epistaxis, management of bleeding cavitory lesions, photochemical effects (diagnostic usage (Kr laser), carcinoma in situ, superficial bronchogenic carcinoma, therapeutic usage (rhodamine B dye laser), palliative resection of malignant airway lesions, curative therapy for carcinoma and juvenile laryngo-tracheobronchial papillomatosis. Photodynamic therapy (PDT) by using porphyrin-based agents and hematoporphyrin derivative “ dihematoporphyrin ether/ester (DHE, Photofrin II) has potential to cure carcinoma in situ and unresectable early stage lung cancer, where infiltration is limited to the bronchial mucosa without hematogenous or lymphatic spread. The main limitation of PDT is the depth of penetration of red light which extends 5 to 15 mm. below the tumor surface. Endobronchial radiation therapy (EBBT) with “ radium seed ” was performed first by Yankauer in 1921. Cryotherapy, the application of extreme cold for local destruction of lining tissue can be achieved at different rates (slow (-100 C per minute and rapid (-100o C per second)). Recently, cryotherapy has been combined with chemotherapy and radiotherapy in managing endobronchial tumors and benign endobronchial lesions, as well as extraction of friable foreign bodies and stenting of the airway. The relative contraindications to the bronchoscopic procedure include intractable bleeding diathesis, acute hypercapnia, and hypoxemia refractory to supplemental oxygen, severe pulmonary hypertension, and cardiovascular instability.

In conclusion, FOB is an effective and safe procedure for diagnostic and therapeutic interventions of airway and pulmonary lesions. The complications vary from cough and mild hypoxia to severe life-threatening complications that are minimized by careful assessment of the risk-benefit ratio in high-risk patients and strict adherence to patient safety protocols. Nevertheless, RB remains the gold standard for various complex airway and pulmonary pathologies.

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Conflicts of interest

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