



# **ASSESSMENT OF PATIENTS UNDERGOING BRONCHOSCOPY**

## **Thesis**

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Degree in Chest Diseases & Tuberculosis

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## List of Abbreviations

<b><math>\chi^2</math></b>	A chi-square test for independence compares two variables in a contingency table to see if they are related.
<b>ABG</b>	Arterial blood gases.
<b>AD</b>	Anno Domini (used to indicate that a date comes the specified number of years after the traditional date of Christ's birth).
<b>AFB</b>	Autofluorescence bronchoscopy.
<b>APC</b>	Argon plasma coagulation.
<b>BAL</b>	Bronchioalveolar lavage.
<b>BC</b>	Before Christ.
<b>BMI</b>	Body mass index.
<b>BPF</b>	bronchopleural fistula
<b>BUN</b>	Blood urea nitrogen.
<b>CAO</b>	Central airway obstruction.
<b>CBC</b>	Complete blood picture
<b>CCD</b>	Charge coupled device
<b>CCP</b>	cerebral perfusion pressure
<b>CMV</b>	Cytomegalovirus
<b>COPD</b>	Chronic obstructive pulmonary diseases.
<b>CPAP</b>	Continuous positive airway pressure
<b>CT</b>	Computed tomography
<b>CXR</b>	Chest x-ray
<b>DDAVP</b>	Desmopressin acetate tablets
<b>DM</b>	Diabetes mellitus
<b>EBB</b>	Endobronchial brachytherapy
<b>EBNA</b>	Endobronchial needle aspiration
<b>EBUS</b>	Endobronchial ultrasound
<b>ENB</b>	Electromagnetic navigation bronchoscopy
<b>FB</b>	Foreign body

<b>FEV1</b>	Forced expiratory volume during the first second of the expired breath.
<b>FFP</b>	Fresh frozen plasma.
<b>FiO2</b>	Inspired oxygen
<b>FOB</b>	Fiberoptic bronchoscopy
<b>FVC</b>	Forced vital capacity
<b>GA</b>	General anesthesia
<b>GPA</b>	Granulomatosis with Polyangiitis
<b>HB</b>	Hemoglobin.
<b>HIV</b>	The human immunodeficiency virus.
<b>HTN</b>	Hypertension.
<b>ICP</b>	Intracranial pressure.
<b>ICU</b>	Intensive care unit
<b>IHD</b>	Ischemic heart disease.
<b>ILD</b>	Interstitial lung diseases.
<b>INR</b>	International normalized ratio
<b>IP</b>	Interventional pulmonologists
<b>LFTs</b>	Liver function tests
<b>LMA</b>	Laryngeal mask airway
<b>MI</b>	Myocardial infarction.
<b>mPAP</b>	Mean pulmonary arterial pressure.
<b>N</b>	Number.
<b>NBI</b>	Narrow band imaging.
<b>Nd: YAG laser</b>	Neodymium-doped yttrium aluminum garnet.
<b>Nd: YAP laser</b>	Neodymium yttrium aluminum perovskite.
<b>NIV</b>	Non-invasive ventilation.
<b>P</b>	P -value which is the level of marginal significance within a statistical hypothesis test representing the probability of the occurrence of a given event.
<b>PaO2</b>	Arterial oxygen tension.
<b>PAP</b>	Pulmonary artery pressure.
<b>PCO2</b>	Partial pressure of carbon dioxide.

<b>PCP</b>	Pneumocystis jiroveci pneumonia.
<b>PDT</b>	Photodynamic therapy.
<b>PEEP</b>	Positive end expiratory pressure.
<b>PH</b>	Pulmonary hypertension.
<b>PJP</b>	Pneumocystis jiroveci pneumonia.
<b>PO2</b>	Partial pressure of oxygen.
<b>PTT</b>	The partial thromboplastin time.
<b>RB</b>	Rigid bronchoscopy.
<b>RFTs</b>	Renal function tests.
<b>SD</b>	Standard deviation.
<b>SEMS</b>	Self- expandable metallic stent.
<b>sPAP</b>	Systolic pulmonary artery pressure.
<b>SPO2</b>	Oxyhemoglobin saturation.
<b>ST</b>	ST segment of the electrocardiogram.
<b>SVC</b>	Superior vena cava.
<b>T</b>	T-value measures the size of the difference relative to the variation in your sample data.
<b>TB</b>	Tuberculosis.
<b>TBB</b>	Transbronchial biopsy.
<b>TBBX</b>	Transbronchial lung biopsy.
<b>TBNA</b>	Transbronchial needle aspiration.
<b>VAS</b>	The visual analogue scale.
<b>VATS</b>	Video-assisted thoracoscopic surgery.
<b>XFL</b>	X-ray fluoroscopy.



## **Introduction**

Endoscopic techniques, flexible, rigid bronchoscopy and thoracoscopy are central tools in the evaluation and treatment of respiratory disorders and their use has been steadily growing. The first rigid bronchoscopy was performed in 1897 when Gustav Killian removed a piece of pork bone from the main bronchus of a 63-year-old farmer thus avoiding a tracheotomy. <sup>(1), (2)</sup>

Ikedia then, in the late 60s pioneered fiberoptic bronchoscopy as a tool to enter subsegmental bronchi and obtain specimens for early diagnosis of lung cancer. <sup>(3)</sup>

Diagnostically, rigid and fiberoptic bronchoscopy are used for sampling of respiratory secretions and cells via bronchial washings, brushings, lavage of peripheral airways and alveoli, and to obtain biopsies of endobronchial, parenchymal, and mediastinal structures. <sup>(4-6)</sup>

Therapeutically, it is used for suctioning of retained secretions, endobronchial stent placement, balloon dilation of airway stenosis, and other interventional procedures. <sup>(4-6)</sup>

According to national and international standards of practice, both general and local anesthesia are used for bronchoscopy, general is more often used with rigid bronchoscopy, while local anesthesia with sedation is used with fiberoptic bronchoscopy. <sup>(7)</sup>

Detailed information about the patient's current and past medical history should be obtained for preoperative assessment. Alongside smoking history, occupational exposure, and comorbidities such as asthma, COPD, cardiovascular status (myocardial infarction, arrhythmias, unstable

angina, and congestive heart failure), bleeding disorders (thrombocytopenia, immunosuppression, uremia, and impaired liver function), allergies and medications (blood thinners and anticoagulant therapy).<sup>(8), (9)</sup>

Post-operative care should focus on the most common complications, such as acute airway obstruction, bleeding, mucus retention, pneumothorax, respiratory failure and cardiac dysfunction. Hypoxic events subsequent to bronchoscopic procedures can occur in as many as 80% of the patients; oxygen supplementation after the procedure successfully reduces such hypoxic episodes, particularly in subjects with impaired lung function.<sup>(10), (11)</sup>

Patient satisfaction has grown into a target that all healthcare systems are trying to reach although no universal methods of testing it was approved in the literature.<sup>(12-14)</sup>

## **Aim of the work**

The aim of this study is to assess patient satisfaction pre, during and post bronchoscopic procedure.

## **Chapter (1)**

### **History of bronchoscopy**

First access trial of a patient's airway was executed by Hippocrates (460-370 BC) who advised the introduction of a pipe into the larynx in a suffocating patient. Avienna of Bucharra (about 1000 AD) used a silver pipe for the same purpose. <sup>(15)</sup>

Experiments for the inspection of the larynx by mirrors had been performed among others by Latour (1825), Senn (1829), Belloc (1837), Liston (1840), and Avery (1844). <sup>(16)</sup>

However, it was not a physician but a singing teacher in London Manuel Garcia, who first observed his own larynx in 1854 with the help of a dental mirror. <sup>(17)</sup>

Almost at the same time without knowing Garcia's work, the laryngologist Ludwig Turck in Vienna performed first experiments with a similar device in 1856. In winter when the illumination by daylight was no longer sufficient for continuation of his studies, he lent the device to the physiologist Czermak in Budapest. That is when czermak published results in laryngeal inspection before Turck, resulting in a long fight over the credit for discovery. The so-called Turkenkrieg (turks war). <sup>(17), (18)</sup>

By the application of the laryngeal mirror, considered to be the first in vivo evaluation of the airways, diagnosis and treatment of laryngeal diseases became much easier. <sup>(17), (18)</sup>

Then, first therapeutic rigid bronchoscopy (RB) was performed in 1897 by Professor Gustav Killian at the Department of Otolaryngology, Freiburg University, Germany. <sup>(19)</sup>

He used a Mikulicz-Rosenheim rigid esophagoscope with rigid forceps to remove a piece of a pork bone from the right main stem bronchus of a 63-year-old farmer using topical cocaine to locally anesthetize the airway. <sup>(20), (21)</sup>

This was the first documented case of a foreign body (FB) removal; however, RB had been performed earlier by Professor Killian on tracheotomized patients and volunteers for airway examinations. <sup>(20), (21)</sup>

In 1920, Chevalier Jackson performed the first RB in the United States. He is regarded as the “Father of American bronchoesophagology” and practiced primarily in Pennsylvania. His career is noteworthy for many reasons, including his avidity for education and innovation. He modified the scope to match the tracheal length, improved upon current instruments, as well as advancing the scope’s optics. <sup>(19) (22-23)</sup>

The manufacturing of the optical telescope was advanced in the 1940s to 1950s by Broyles and Hopkins, introducing the telescope optic, optical forceps, and improving lighting and imaging. <sup>(21)</sup>

The primary focus of RB in the early years was FB removal. Later, in the 1950s and beyond, alongside advances in anesthesia and technology the rigid scope gained more popularity. However, primarily in the surgical world, RB was recognized as a useful tool for central airway tumor debulking. <sup>(23)</sup>

RB again took a major leap forward thanks to Jean-Francois Dumon in the 1980s, as he continued with innovation, incorporating laser ablation and stenting. His work stoked the burgeoning interest in RB, ushering in a new field in pulmonology. <sup>(23)</sup>

In the spring of 1964, Professor Shigeto Ikeda, a Japanese thoracic surgeon, requested Machida optical company to produce a prototype of the first flexible bronchofiberscope, a similar request was made by the end of 1965 to Olympus optical company. <sup>(24)</sup>

In July 1965, Machida delivered its prototype of the first flexible bronchofiberscope to professor Ikeda, but it is not until April 1968 that it succeeded in the commercial production thereof. <sup>(24)</sup>

Olympus on the other hand delivered its prototype of flexible bronchofiberscope in August 1966. <sup>(24)</sup> As such, endoscopic examination of the bronchial tree progressed from rigid bronchoscopy originally described by Killian to flexible fiberoptics applied by Ikeda. <sup>(24)</sup>

Ikeda was a forerunner in development of the videobronchoscope. With the rapid progress in electronic devices, Asahi Pentax corp. developed the first prototype of the videobronchoscope in February 1987, which offered a very clear image on a color screen. <sup>(24)</sup>

Ikeda's moto was "there is more hope with the bronchoscope", he continued working on improvements and modifications of flexible bronchoscope until his death on December 25, 2001. <sup>(24)</sup>

## **Chapter Two**

### **Instrumentation and Procedures**

#### **1) Rigid Bronchoscopy:**

Rigid bronchoscope is a straight, hollow metal tube that is available in several sizes it's usually referred to as an open tube bronchoscope, open tube, straight bronchoscope, or ventilating bronchoscope, and since it's such an unyielding instrument it usually requires an operating room and patient to be put under general anesthesia. External diameter of a rigid bronchoscope varies from two to 14 mm but extra-large diameter tubes have been developed for exceptional cases of tracheobronchomalacia although it is not readily available. Wall thickness is about 2 to 3 mm while its length varies depending on the age group of the patient from 33 to 43 cm. <sup>(25)</sup>

Most rigid bronchoscopes are of the same diameter from the proximal to the distal end, but some have a tapered tip to lift the epiglottis for easier intubation, to facilitate the dilation of airway strictures or to cut or core at a tumor edge. Most rigid bronchoscopes are round when visualized in cross-section, with external side ports that permit the introduction of suction catheters, laser fibers, and ventilation (figure 1) (12). A few are almost oval. A small internal channel exists in some rigid bronchoscopes through which the rigid telescope passes (figure 2). Others are simply an empty tube. Some new rigid bronchoscopes can analyze exhaled gases. <sup>(26, 27)</sup>