ASSESSMENT OF PATIENTS UNDERGOING BRONCHOSCOPY

Thesis
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Degree in Chest Diseases & Tuberculosis

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List of Abbreviations

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

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

PCP	Pneumocystis jiroveci pneumonia.
PDT	Photodynamic therapy.
PEEP	Positive end expiratory pressure.
PH	Pulmonary hypertension.
PJP	Pneumocystis jiroveci pneumonia.
PO2	Partial pressure of oxygen.
PTT	The partial thromboplastin time.
RB	Rigid bronchoscopy.
RFTs	Renal function tests.
SD	Standard deviation.
SEMS	Self- expandable metallic stent.
sPAP	Systolic pulmonary artery pressure.
SPO2	Oxyhemoglobin saturation.
ST	ST segment of the electrocardiogram.
SVC	Superior vena cava.
T	T-value measures the size of the difference relative to the variation in your sample data.
TB	Tuberculosis.
TBB	Transbronchial biopsy.
TBBX	Transbronchial lung biopsy.
TBNA	Transbronchial needle aspiration.
VAS	The visual analogue scale.
VATS	Video-assisted thoracoscopic surgery.
XFL	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. [(1), (2)]

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. [(3)]

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. [(4-6)]

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

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. [(7)]

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). [8], [9]

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. [10], [11]

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. [12-14]

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 Buchara (about 1000 AD) used a silver pipe for the same purpose. [15]

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). [16]

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. [17]

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). [17], [18]

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. [17], [18]

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

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. [20], [21]

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. [20], [21]

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. [19] [22-23]

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. [21]

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. [23]

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. [23]

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. [24]

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. [24]

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

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. [24]

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. [24]

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. [25]

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. [26, 27]