Uses of Flexible Fiberoptic Bronchoscopy in I.C.U

An Essay

Submitted for partial fulfillment of
Master Degree in
General intensive care medicine

By

Mahmoud Mohamed Elsayed Eladl

M.B., B.Ch. (Tanta University)

Under supervision of

Prof.Dr/ Hala Gomaa Salama Awad

Professor of Anesthesia, Intensive Care and Pain Management

Faculty of Medicine- Ain Shams University

Prof.Dr/Adel Mekhail Fahmy Shnodah

Professor of Anesthesia, Intensive Care and Pain Management

Faculty of Medicine - Ain Shams University

Dr/ Walid Ahmed Mansour

Lecturer of Anesthesia, Intensive Care and Pain Management

Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University
2015

Acknowledgement

*First and foremost thanks to "**ALLAH,**" the most merciful to whom I relate any success in my life.*

*I am delighted to express my sincere appreciation to **Prof. Dr/ Hala Gomaa Salama Awad***

Professor of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Ain Shams University, for her constant help, instructive supervision and valuable guidance.

*My sincere thanks **Prof. Dr/Adel Mekhail Fahmy Shnodah***

Assistant Professor of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Ain Shams University, for his expert advice, kind supervision, great help and the time and effort he generously gave me.

*My sincere thanks to **Dr/ Walid Ahmed Mansour***

Lecturer of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Ain Shams University, for his unlimited help, continuous guidance and encouragement throughout this study.

*I would like to express my hearty thanks to **my family and my colleagues** , for their support, understanding and tolerance till this work was completed.*

Contents

List of Abbreviations

Abbreviation	*Meaning*
AAI	Alaris Auditory Evoked Potential Index
ABG	Arterial Blood Gas
AIDS	Acquired Immune Deficiency Syndrome
AMI	Acute Myocardial Infarction
AROC	Area Under Receiver Operating Characteristic
BAL	Broncho-alveolar Lavage
BIS	Bispectral Index
BPF	Bronchopleural Fistula
BTS	British Thoracic Society
CAP	Community Acquired Pneumonia
CCD	Charge Coupled Device
CMV	Cytomegalo Virus
COPD	Chronic Obstructive Pulmonary Disease
CPIS	Clinical pulmonary Infection Score

CPP	Cerebral Perfusion Pressure
CT	Computed Tomogram
CYP450	Cytochrome P
DDAVP	Desamino-D-Arginine Vasopressin
EBUS	Endobronchial Ultrasound
EEG	Electroencephalogram
ETCO2	End-Tidal CO2
ETT	Endotracheal Tube
FEV1	Forced Expiratory Volume (In 1 Sec)
FFB	Flexible Fiberoptic Bronchoscopy
GABA	Gamma-Aminobutyric Acid
HCAP	Health Care Associated Pneumonia
HIV	Human Immunodeficiency Virus
ICP	Intra Cranial Pressure
ICU	Intensive Care Unit
ILD	Interstitial Lung Diseases
MAP	Mean Arterial Pressure
MLEAPS	Middle Latency Auditory Evoked Potential
MV	Mechanical Ventilation
NMDA	N-Methyl-D-Aspartate

PDT	Percutaneous Dilatational Tracheostomy
PEEP	Positive End-Expiratory Pressure
PJP	Pneumocystis Jiroveci Pneumonia
PSB	Protected-Specimen Brushing
RB	Rigid Bronchoscopy
ROSE	Rapid On-site Evaluation
SAO2	Arterial Oxygen Saturation
SPO2	Blood Oxygen Saturation
TB	Tuberculosis
TBBX	Transbronchial Biopsy
TBNA	Transbronchial Needle Aspiration
TTNA	Transthoracic Needle Aspiration
VAP	Ventilator Associated Pneumonia

List of Tables

List of Figures

Introduction

Since its introduction in daily medical practice in the late 20th century, flexible bronchoscopy (FB) has had an increasing role in the everyday life of the pulmonologist. Particularly for patients hospitalized in intensive care units (ICUs), FB has changed current diagnostic and therapeutic approaches. The versatility of the flexible bronchoscope, combined with its portability, allows one to perform the technique at the bedside, and this is of major importance in the unstable patient, who is often unable to be transported safely to the bronchoscopy suite ***(Fragoso and Rosal, 2011).***

FB performed in the ICU has its own specificities, either with regard to the patient or the environment that surrounds him or her. The critical patient often has one or more organ failures, which makes him or her a high-risk patient for the procedure. Moreover, as respiratory system involvement is a common feature, regardless of the precipitating factor of critical illness, the risk of respiratory failure is not negligible. Finally, the unstable character of such patients' diseases imposes time constraints and puts pressure on the bronchoscopist: the procedure must be rapidly performed and in certain circumstances absolute safety cannot be guaranteed throughout the examination, yet the urgency of it makes it imperative ***(Fragoso and Rosal, 2011).***

In relation to the surroundings, the bronchoscopist is faced with a reduced amount of space, because of crowding of the monitoring equipment and therapeutic devices, quite different from the comfortable and controlled environment of a bronchoscopy suite. These aspects, taken together, imply an additional technical preparation. FB can be performed safely, as long as certain principles are met, but one must keep in mind potentially serious complications that can arise from this procedure ***(Fragoso and Rosal, 2011).***

Because of its efficiency and safety in trained hands, it has been used increasingly in the unstable patient, particularly the patient under mechanical ventilation. FB in critical patients should always be performed by skilled pulmonologists or intensivists. There is no clear evidence in the literature suggesting the minimum number of procedures one needs to perform to be considered well trained, and most probably that number varies on an individual basis, depending on one's dexterity ***(Plekker et al., 2010).***

Indications and Contraindications of Flexible Fiberoptic Bronchoscopy

Bronchoscopy is a fundamental technique used in the study of respiratory diseases. It provides visualization of the upper airway and initial divisions of the tracheobronchial tree and allows for samples to be taken from the trachea, bronchi, mediastinum and lung parenchyma. Furthermore, it is essential in the therapeutic management of patients with hemoptysis, aspiration of a foreign body, excess secretions, neoplastic lesions and obstruction of the central airway ***(Esquinas et al., 2013).***

Bronchoscopy has become a key element in modern pulmonology: it has diagnostic indications in most respiratory diseases and is the cornerstone in some aspects of current respiratory therapy methods. Among the different types of bronchoscopy, flexible bronchoscopy (introduced in 1968 by Ikeda) is the most widely used technique, although there are other types, such as rigid bronchoscopy (RB) or endobronchial ultrasound-guided bronchoscopy (EBUS) ***(Colt et al., 2011).***

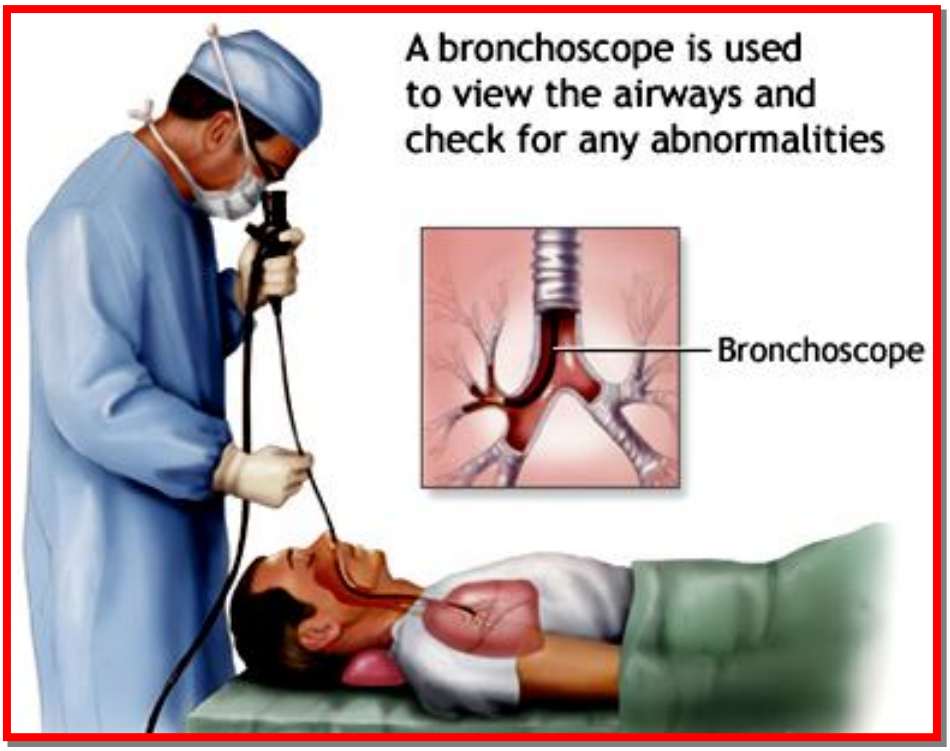

Fig. 1: Procedure of Bronchoscopy.

(Shah, 2012)

Bronchoscopy is the visual examination of the lungs and air passages, called bronchial tubes **(Fig.1)**. The exam is performed with a bronchoscope, an instrument with a lighted tip. Bronchoscopy is also used to obtain tissue and secretion samples, and to wash the tissues with saline, a procedure called lavage, which can help a doctor diagnose cancer or an infection ***(Esquinas et al., 2013).***

Diagnostic and therapeutic procedures opertaining to these areas include, but are not limited to, rigid bronchoscopy, transbronchial needle aspiration (TBNA), auto fluorescence bronchoscopy, endobronchial ultrasound (EBUS), transthoracic needle aspiration (TTNA) and biopsy, laser bronchoscopy, endobronchial electrosurgery, argon-plasma coagulation, cryotherapy, airway stent insertion, balloon bronchoplasty and dilatation techniques, endobronchial radiation, photodynamic therapy, percutaneous dilatational tracheotomy, transtracheal oxygen catheter insertion, medical thoracoscopy, and imaging-guided thoracic interventions ***(Fruchter et al., 2011)***.

***Bronchoscopy in the intensive care unit*:**

Respiratory involvement is common in the critically ill patient in the intensive care unit (ICU) with 30-50% of the admissions requiring the use of mechanical ventilation. FFB remains a very valuable tool in the evaluation and management of these patients as well as to evaluate complications of mechanical ventilation especially atelectasis and VAP. Bronchoscopy in the ICU plays a role as a diagnostic and therapeutic tool. Many of the

indications for bronchoscopy in the ICU overlap with the general indications for the procedure as discussed above ***(Fuentes and Venkatram, 2012)***.

Bronchoscopy Unit

Equipment:

The bronchoscope is essentially a flexible tube consisting of fibreoptic bundles, channels for instruments and a number of wires for manipulating the distal end. The bundles of optical fibres carry light to the distal end in order to illuminate the airways, and further bundles transmit the image back to the eyepiece **(Fig.2)**. The modern video bronchoscopes have a charge-coupled device (CCD) chip at the distal end which captures the image and is subsequently transmitted to the monitor **(Figs. 3-5)** ***(Shah, 2012)***.

The resolution of the image is excellent and continues to improve, with some scopes providing very high-definition images with digital magnification options. There are also hybrid devices for special circumstances, which use the fibreoptic bundle to transmit the image back towards the head of the bronchoscope. In this case, the CCD is located