Assessment of the Efficacy of Nebulized Local Anaesthesia Using Continuous Positive Airway Pressure during Fibroptic Bronchoscopy

Thesis

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List of Abbreviations

Abb.	Full term
APAP	*Automatic Positive Airway Pressure*
cm/H2O	*Centimetres of Water*
CPAP	*Continuous Positive Airway Pressure*
EPAP	*Expiratory Positive Airway Pressure*
FiO2	*Fraction of Inspired Oxygen*
GER	*Gastro Esophageal Reflux*
HCFA	*Health Care Financing Administration*
HS	*Highly Significant*
ICU	*Intensive Care Unit*
IPAP	*Inspiratory Positive Airway Pressure*
NIV	*Noninvasive Ventilation*
NPPV	*Non Invasive Positive Pressure Ventilation*
NS	*Non Significant*
OSA	*Obstructive Sleep Apnea*
PAP	*Positive Airway Pressure*
S	*Significant*
S/T	*Spontaneous/Timed*

ABSTRACT

Background: The administration of nebulized lidocaine before fiberoptic bronchoscopy (FOB) is preferred than conventional lidocaine spray methods in reducing complications, reducing the need for additional lidocaine doses, and decreasing the incidence of lidocaine adverse effects. The use of nebulized lidocaine through continuous positive airway pressure (CPAP) seems to be superior owing to rapid and deep deposition of the anesthetic agent. The aim of this research is to study if the use of nebulized lidocaine through CPAP is superior to the conventional methods of lidocaine spray before FOB.

Patients and Methods: An observational prospective cohort study was performed in the Chest Department at Ain Shams University hospitals on 40 patients subjected to FOB. They were randomly divided into two groups: group A included 20 patients who underwent FOB using nebulized lidocaine through CPAP, and group B included 20 patients who underwent FOB using conventional lidocaine spray. After doing FOB, we noticed the need for additional doses of lidocaine to complete FOB, duration of FOB, easy entry of the FOB, and incidence of complications.

Results: Interestingly, patients in group A needed less additional doses of lidocaine spray to complete FOB. Moreover, they had less incidence of coughing and occurrence of gag reflex during FOB, and also less patients' discomfort, but both duration of FOB and easy entry of the FOB are the same in both groups.

Conclusion: Administration of nebulized lidocaine through CPAP before FOB leads to decreased use of lidocaine with less incidence of its adverse effects when compared with conventional method of lidocaine spray, and also it has better patient acceptance than lidocaine spray owing to its unpleasant taste. So it should be recommended for use before FOB on a wider scale.

Keywords: Continuous Positive Airway Pressure, Fiberoptic Bronchoscopy, Nebulized Lidocaine, Lidocaine Spray

INTRODUCTION

Since its introduction in the late 1960s, fibroptic bronchoscopy has been increasingly used for diagnostic and therapeutic purposes.

The most common indication for fibrotic bronchoscopy was suspected bronchogenic carcinoma (32.2%), followed by pulmonary infections, (18.6%) and interstitial lung diseases (13%) whereas disorders such as haemoptysis and pleural effusion showed a declining trend as an indication for fibrotic bronchoscopy ***(Gupta et al., 2015).***

Diagnostic purposes include conventional TBNA that is used to sample hilar and mediastinal lymph nodes in cases of suspected malignant involvement or sarcoidosis, EBUS & TBNA with high sensitivity and specificity for identifying malignancy when used for sampling para tracheal and peribronchial lung masses, also has high sensitivity for identifying non caseating granulomas.

Therapeutic techniques include debulking through rigid bronchoscopy with the ability to control the airway and remove large volume of tumor followed by stenting to maintain airway patency.

Another recent purposes include endobronchial diathermy argon plasma coagulation & cryo extraction used in critical airway obstruction.

Endobronchial valves in treatment of emphysema.

Electromagnetic navigation bronchoscopy to locate tumor not visible under direct vision

(Wahidi et al., 2007).

Regarding contraindications of fibroptic bronchoscopy, it includes uncooperative patient, CO2 retention, low po2, coagulation defect, tracheal stenosis, acute myocardial infarction, bronchial asthma ***(Sahn and Lakshminarayan, 1976).***

Regarding local anaesthesia in fibroptic bronchoscopy, it was delivered through many methods e.g spray as you go bronchoscopically, transcricoid, trans tracheal and or by nebulizer.

Topical anasethesia in fibroptic bronchoscopy was through direct application on the mucous membrane using different agents e.g lidocaine 2-10%, benzocaine 20%, tetracaine 1% and cocaine 4%

Lidocaine is the most commonly used local anaesthetic for fiberoptic bronchoscopy. It is short-acting, has a wide margin of safety and tissue toxicity is rare. When applied on mucous membranes in the upper airway, peak serum of lidocaine concentrations are 25-50% lower than if the same dose had been given intravenously. However, the administration of lidocaine solution to the lower bronchial tree may result in significant serum concentration.

Central nervous system and cardiac toxicity should be expected only when higher doses are used.

Lidocaine can be sprayed onto the tongue, oropharynx and pharynx, and can be applied directly through the bronchoscope to the visualized glottis. Nebulization can also be used just prior to the procedure.

Aerosolized benzocaine (20% solution) was commonly used in the past but its action is short Tetracaine (1%) and cocaine (4%) are seldom used due to toxicity of the first and the possible addictive effect of the later.

(Webb et al., 1990).

Aim of the Work

The aim of work is to study the efficacy of CPAP device in delivering nebulized lidocaine during FOB and to compare this method with the conventional method of local anasethseia.

Chapter 1
ANAESTHESIA FOR FIBROPTIC BRONCHOSCOPY

Bronchoscopy as an investigation or therapeutic procedure demands anaesthesiologist to act accordingly. These procedures are now done as day care procedures in the operation theatre or in critical care units. Recently, conscious sedation has come up as the commonly used anaesthetic technique for simple bronchoscopic procedures. However, general anaesthesia still remains a standard technique for more complex procedures. New advances in the field of anaesthesiology such as use of short acting opioids, use of newer drugs such as dexmedetomidine, supraglottic airways and mechanical jet ventilators have facilitated and eased the conduct of the procedure.

Anaesthesia for bronchoscopy poses unique challenges for the anaesthesiologist. By definition, bronchoscopy is an endoscopic technique to visualise the inside of the airways for diagnostic and therapeutic purposes. This procedure needs specific technical precision because both the anaesthesiologist and operator share the same working space, that is, the airway. Advances in technology and instrumentation have made it a much safer procedure.

(Taha et al., 1997)

Historical background of fibroptic bronchoscope

The flexible fibroptic bronchoscope was first indroduced in 1966 Shigeto Ikeda, a Japanese thoracic surgeon who, was therefore regarded as the father of fibroptic bronchoscopy. On the other hand, the older rigid bronchoscope was introduced by Gustav Killian of Germany and improved later by Chevalier Jackson of the United States of America ***(Bopparajuss and Surani, 2014).***

He approached the Machida Corporation to develop a flexible bronchoscope with a diameter of less than 6 mm. In 1964, the prototype device was developed, which since then has undergone numerous revisions. The first useful device was presented at Copenhagen in 1966. This device comprising over 15, 000 glass fibers was the first modern-day fiber-optic bronchoscope ***(Miyazwa et al., 2000).***

After the optical technology was incorporated, the next round of modifications involved the adoption of a working channel. This Machida flexible bronchoscope became available in 1968, which is known as the year of the "second revolution" in bronchoscopy. Researchers further revised the bronchoscope to make it more maneuverable at the tip that allows U-turn angulation for entry into the upper lobes. Olympus first came out with its model in 1970 with better imaging capabilities as well as ease of handling ***(Miyazwa et al., 2000).***

The first video bronchoscope developed by Asahi Pentax Corporation (1967) also involved significant contributions from Shigeto Ikeda ***(Miyazwa et al., 2000).***

Today, video bronchoscopy is an integral part of the practice of chest medicine as most ailments of the airways can be diagnosed, palliated, or sometimes cured by use of the flexible bronchoscope. Although removal of foreign bodies from the endobronchial tree was the initial application for the rigid bronchoscope currently the majority of foreign bodies, even in the pediatric age group, are successfully removed with the flexible bronchoscope in a relatively noninvasive fashion ***(Swanson et al., 2002).***

The FOB has replaced the traditional rigid bronchoscope in its many diagnostic and therapeutic applications. Its dominance is mainly due to its small size flexibility that permits visualization of segmental and subsegmental bronchi and therefore the detection of more peripheral lesions ***(Taha et al., 1997).***