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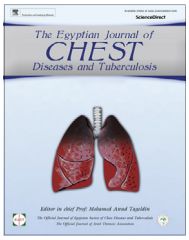

ORIGINAL ARTICLE

Role of bronchoscopy during non invasive ventilation in hypercapnic respiratory failure

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KEYWORDS

Bronchoscopy;
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Abstract *Introduction:* Non invasive positive pressure ventilation (NIPPV) is the first line treatment for hypercapnic acute respiratory failure (ARF) secondary to COPD exacerbation in selected patients. Limited data exist supporting the use of fiberoptic bronchoscopy (FOB) during this clinical setting. The aim of this study is to assess the role of FOB during NIPPV in patients with decompensated COPD acute exacerbation.

Methods: This study is a randomized prospective case control pilot study carried out on 50 patients - admitted to critical care units at Alexandria University Hospital, Egypt - suffering from hypercapnic ARF secondary to COPD exacerbation with Kelly Matthay Score from 2 to 4. All patients received NIPPV. Patients were divided randomly into 2 equal groups: group I (cases) (25 patients) was subjected to additional intervention of early FOB during the first 6–12 h from admission while group II (control) (25 patients) received the conventional treatment and NIPPV only. Outcome parameters measured were changes in ABG data, duration of NIPPV, rate of its success, ICU stay and mortality as well as the safety of FOB and possible complications.

Results: No significant difference was detected between the 2 groups regarding the baseline characteristics. No serious complications happened from FOB, and Oxygen desaturation happened in 4/25 patients (16%), Tachycardia in 2/25 patients (8%). In group I, 23 patients (92%) were successfully weaned from NIPPV versus 16 patients (64%) in group II ($p = 0.037$). Total duration of NIPPV was 28.52 h in group I versus 56.25 h in group II ($p = 0.001$). Length of ICU stay was 4.84 days in group I versus 8.68 days in group II ($p = 0.001$). Only 1 patient died in group I versus 3 patients in group II ($p = 0.609$).

Conclusion: The early application of FOB during NIPPV in patients with ARF due to COPD exacerbation was shown to be safe. Significant improvement in the outcome of patients who underwent FOB was noticed in terms of improved ABG data, shorter duration of NIPPV, higher percentage of success and shorter ICU stay while no significant difference was detected in mortality.

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Introduction

The American Thoracic Society, European Respiratory Society, and the British Thoracic Society have each defined COPD using slightly different wordings and approaches over the past 15 years.The Global Initiative for Chronic Obstructive Lung Disease (GOLD) a report produced by the National Heart, Lung, and Blood Institute (NHLBI) and the World Health Organization (WHO) defines COPD as a preventable and treatable disease with some significant extrapulmonary effects that may contribute to the severity in individual patients. Its pulmonary component is characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases [1].

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) – a report produced by the National Heart, Lung, and Blood Institute (NHLBI) and the World Health Organization (WHO) – defines an exacerbation of chronic obstructive pulmonary disease (COPD) as an acute increase in symptoms beyond normal day-to-day variation .This generally includes an acute increase in one or more of the following cardinal symptoms: cough increases in frequency and severity, sputum production increases in volume and/or changes character, and dyspnea increases [2].

It is estimated that 50–60 percent of exacerbations are due to respiratory infections (mostly bacterial like *Haemophilus influenzae*, *Moraxella catarrhalis*, *Streptococcus pneumoniae*, *Pseudomonas aeruginosa* and Enterobacteriaceae and viral like rhinoviruses. Influenza, parainfluenza, coronavirus, and adenovirus), 10 percent are due to environmental pollution, and 30 percent are of unknown etiology [3].

Some COPD exacerbations of unknown etiology may be related to other medical conditions, such as myocardial ischemia, heart failure, aspiration, or pulmonary embolism [4]. Patients with COPD who present to the hospital with acute worsening of dyspnea should be evaluated for potential alternative diagnoses, such as heart failure, pulmonary thromboembolism, and pneumonia. This was illustrated in an autopsy study of 43 patients with COPD who died within 24 h of admission for a COPD exacerbation .The primary causes of death were heart failure, pneumonia, pulmonary thromboembolism, and COPD in 37, 28, 21, and 14 percent, respectively [2].

Noninvasive positive pressure ventilation (NIPPV) refers to mechanical ventilation delivered through a noninvasive interface, such as a face mask, nasal mask, or nasal prongs; it is more comfortable allowing expectoration, eating, speech and prevents rebreathing than full face mask. The face mask is generally preferred over a nasal mask or nasal prongs during the initiation of NIV for several reasons. Most patients with acute respiratory failure are mouth breathers; therefore, NIV delivered by a nasal mask results in a large air leak through the mouth and a worse outcome. The nasal air passages offer significant resistance to airflow, which can mitigate the beneficial effects of NIPPV if a low level of positive airway pressure is used. There are two principal forms used: Pressure support ventilation (PSV) and bilevel positive airway pressure (BiPAP). PSV is the most common mode chosen by clinicians who want to maximize patient comfort and synchrony. Both provide positive airway pressure during the respiratory cycle, but BiPAP offers pressure in a biphasic manner, with higher pressures during inspiration than expiration. Studies in patients with obstructive lung disease indicate that low-level CPAP offsets the detrimental effects of auto-positive end-expiratory pressure, which are caused by gas trapped in alveoli at end expiration and decreases inspiratory work of breathing. The addition of inspiratory pressure support to CPAP (or BiPAP) generally improves tidal volume in proportion to the amount of pressure applied .Both CPAP and BiPAP have been used as an alternative to intubation in patients with a variety of respiratory conditions, including congestive heart failure with pulmonary edema and COPD, avoiding the complications associated with endotracheal intubation. It improves numerous clinical outcomes and is the preferred method of ventilatory support in many patients with an acute exacerbation of COPD complicated by hypercapnic acidosis [5,6].

NIPPV has physiologic benefits. Respiratory mechanics measured after the initiation of NIPPV demonstrate a decreased respiratory rate, an increased tidal volume, and increased minute ventilation. In addition, the arterial oxygen tension (PaO2) tends to increase as the PaCO2 decreases. The pressure support level should be increased until patient's respiratory rate is below 30 breaths per min because this respiratory rate indicates that the inspiratory effort has been reduced to a reasonable level. However, the expiratory effort of patients with COPD may increase when the pressure support is increased, which makes selection of the optimal pressure support level difficult [7].

Flexible fiberoptic bronchoscopy (FOB) has become an indispensable tool in the optimal management of intensive care unit (ICU) patients with both diagnostic and therapeutic goals. Its safety and usefulness, in well-trained hands with appropriate precautions, have led to its increasing use even in unstable and mechanically ventilated patients. Currently, rigid bronchoscopes are not often used except for the management of massive hemoptysis, removal of tracheobronchial foreign bodies, laser photoresection for obstructing endobronchial tumours, dilatation of tracheobronchial strictures and placement of airway stents [8,9].

In bronchoalveolar lavage (BAL), the FOB is wedged into a subsegmental bronchus and multiple aliquots (20–50 ml) of saline are instilled into that lung segment and then withdrawn by suction. The centrifuged BAL fluid is stained for opportunistic pathogens and cultured. Although 200 ml was once considered the maximum, recent literature demonstrates that lavage volumes of up to 300 ml are well tolerated. Patients should not eat or drink anything 6–12 h before procedure. Also you to try avoid any aspirin, ibuprofen, or other blood-thinning drugs before procedure. After procedure, your gag reflex will return. However, until it does, patients should not eat or drink anything. To test if the gag reflex has returned, place a spoon on the back of your tongue for a few seconds with light pressure. If patient does not gag, wait 15 min and try it again [10].

So, the aim of this work is to assess the role of early fiberoptic bronchoscopy during non invasive ventilation in acute exacerbation of COPD patients in terms of effectiveness and safety.

Patients

This prospective case control study was carried out on 50 patients, suffering from hypercapneic acute respiratory failure as a result of acute exacerbation of chronic obstructive pul-