Invasive to Noninvasive Ventilation in Chronic Obstructive Pulmonary Disease

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Introduction

Patients with acute exacerbation of chronic obstructive pulmonary disease (COPD) may require endotracheal intubation and ventilatory support. But intubation and mechanical ventilation is fraught with dangers. Potential disasters like pneumothorax and hypotension can occur. Also these patients may require long term ventilatory support [1] with associated complications of ventilator associated pneumonia and tracheo-esophageal fistula. Noninvasive ventilation with orofacial or nasal mask avoids the need for endotracheal intubation and reduces the risk of complications associated with mechanical ventilation. Several investigators have studied the use of noninvasive positive pressure ventilation (NPPV) in patients with acute exacerbation of COPD [2,3]. We present a case that was successfully managed and weaned off early from ventilator using noninvasive positive pressure ventilation.

Case Report

A 65 year old man, known case of chronic obstructive pulmonary disease for last 10 years on regular medication, deteriorated after fever of short duration and was taken to a nearby nursing home in an unconscious state. He was placed on ventilator support because of poor respiratory effort. After 5 days of ventilatory support, he was shifted to this hospital with endotracheal intubation and Ambu bag ventilation. On arrival, patient was having severe respiratory distress with respiratory rate - 48/min, drowsy, cyanosed, oxygen saturation by pulse oximetry 50%, pulse rate - 130/min, blood pressure-180/100. Chest auscultation revealed bilateral extensive wheeze with coarse crepitations. Arterial blood gases showed severe respiratory acidosis with hypoxia. Patient was immediately placed on T-bird ventilator with synchronized intermittent mandatory ventilation mode at breath rate 10/min, tidal volume 450 ml (8ml/kg of weight), and inspired oxygen 45%. Also pressure support of 10 cm H₂O and continuous positive airway pressure of 5 cm H₂O was provided through ventilator. Peak inspiratory pressure was high 40-45 cm H₂O. Salbutamol and Ipratropium nebulisation was given every 4-hours using T-piece connection to ventilator. Chest radiograph showed emphysematous changes, biochemical parameters were

normal. Antibiotics and methylprednisolone 125mg IV 6 hourly were given. After 24 hours of ventilation patient improved, became fully conscious and alert, respiratory rate - 38/min, pulse rate-98/min and blood pressure -160/90. Arterial blood gases were within acceptable range (Table 1). Ventilator mode was changed to pressure support of 10 cm H₂O and continuous positive airway pressure of 5 cm H₂O. Patient remained stable on these settings for next three hours. At this point it was decided to extubate the patient and provide respiratory support using face mask and noninvasive ventilator (Drager, Respicare CV). Patient was provided 10 cm H₂O of inspiratory pressure support and 5 cm H₂O of expiratory pressure support for 24 hours with 2l/min of oxygen supply. For next 24 hours he remained stable on continuous positive airway pressure of 5 cm H₂O, oxygen saturation with pulse oximetry was 95-96%. Other treatment (methylprednisolone for 3 days only) continued, he required 2 l/min nasal oxygen for another week and made uneventful recovery.

Table 1

Arterial blood gas parameters

Parameter	On admission	Before extubation
pH	7.228	7.345
PCO ₂	69.8	47.7
pO ₂	27.1	153.1
BE	-0.9	-0.7
HCO ₃	28.4	25.4
Oxygen saturation	50%	99%

Discussion

Chronic obstructive pulmonary disease patients with endotracheal intubation and mechanical ventilation are difficult to manage because of altered lung mechanics and strong respiratory drive. Mechanical ventilatory assistance without endotracheal intubation offers many advantages like increased comforts to patients, decreased sedation requirement, retention of speech and eating abilities, avoidance of laryngeal injury and preservation of upper airway defense against aspiration and pneumonia. Noninvasive ventilatory support could be either continuous positive airway pressure (CPAP) or combination of continuous positive airway pressure and

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pressure support ventilation (PSV). The application of continuous positive airway pressure at levels that approach 80% to 90% of the measured intrinsic positive and expiratory pressure (PEEP) values may reduce the work of breathing without causing further hyperinflation [4]. The addition of pressure support may further assist ventilation by increasing tidal volume, decreasing respiratory frequency, and further reducing the inspiratory work of breathing performed by the respiratory muscles [5]. Udwadia and coworkers have reported their experience in difficult to wean patients who could be separated from the ventilator using NPPV [6]. Recent results by Nava and associates also show that a deliberate early extubation with a switch to face mask ventilation can result in significant benefits in outcome, fewer complications, and a reduced mortality at 2 months [7]. COPD patients once admitted with respiratory failure are likely to be readmitted to the ICU frequently, for oxygen therapy or ventilatory support. To avoid frequent admissions to the hospital these patients can be advised domiciliary oxygen therapy, and if needed, BIPAP support at home. Although many aspects of noninvasive ventilation in acute exacerbation of COPD are still debatable, such as defining optimal candidates, cost effectiveness and complication rates,

noninvasive ventilation should be in the armamentarium of all intensivists.

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An interesting health tip from Q magazine :-

'In America you can buy melatonin as a vitamin supplement. It is a hormone that your penile gland secretes when it gets dark'.

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