Case Report
Role of noninvasive ventilation in weaning a patient of chronic obstructive pulmonary disease with persistent hypercapnoea from mechanical ventilation

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Abstract
Patients of chronic obstructive pulmonary disease (COPD) presenting with type 2 respiratory failure often require mechanical ventilation. These patients usually end up in prolonged ventilation, ill effects of prolonged intubation and high chances of weaning failure. We are presenting a case of COPD with persistent hypercapnoea who had failed extubation. Patient was later extubated on to noninvasive ventilation (NIV), started on acetazolamide and was weaned from NIV over a couple of days.

Key words: Noninvasive ventilation, Hypercapnoea, Acetazolamide.

Introduction
Patients with COPD presenting during acute exacerbations pose a challenge to intensive care physicians in that, they have impaired pulmonary functions, high intrinsic PEEP and airway resistance. Hence these patients may require prolonged ventilator support and also present difficulties during weaning from the ventilator. [1,2] The process of decreasing the ventilatory support and discontinuation of mechanical ventilation has been termed as weaning, whereas removal of the endotracheal tube is called extubation. We must always balance between the risk associated with early liberation from ventilator and delay in extubation. In the recent years NIV has evolved as one of the novel approach in weaning patients with COPD from mechanical ventilation. Early extubation on to NIV decreases the duration of mechanical ventilation, length of intensive care unit (ICU) stay, incidence of nosocomial pneumonia and improves survival when compared to conventional weaning.

Case History
A 55 year old lady presented to the emergency department with sudden onset of breathlessness since one day. The patient had history of pulmonary tuberculosis treated 10 years back with consequent right upper lobe fibrosis, COPD with emphysematous bullae diagnosed on CT scan and Cor pulmonale. She was diagnosed to have acute exacerbation of COPD with Cor pulmonale. She was admitted in medical step down ICU. On examination the patient was conscious, oriented with normal higher mental functions. She was haemodynamically stable, but with loud P2 and raised JVP. Immediate chest X-ray revealed left side pneumothorax (Fig 1) for which chest drain was inserted. ECG revealed P pulmonale (Fig 2). ABG done showed pH of 7.36, PCO2 of 70 mmHg, PO2 of 94 mmHg and HCO3 of 40. Patient was treated with antibiotics, budesonide & ipratropium nebulization and diuretics.

After a day, patient became drowsy and tachypnoeic with respiratory rate of 38/min. She had bilateral crepts and rhonchi but, maintaining SpO2 of 95% with 6L/min of O2. ABG showed severe respiratory acidosis with pH of 7.17, PCO2 of 134, PO2 of
94 mmHg and HCO$_3$ of 46. Patient was transferred to ICU for further management. Initially the patient was put on NIV for an hour. As there was no improvement in her clinical status she was intubated and was put on ventilator with PRVC- ACMV mode. Serial ABG’s (Table 1) were done following admission to the ICU. On day one of ICU, there was progressive worsening of patient’s respiratory status. The pH gradually deteriorated to 7.14 and PCO$_2$ levels went too high and were not measurable (out of range). Patient was continued on ventilator with full support. There was improvement in the patient’s clinical status over the next 2 days. On day 3 ABG showed pH of 7.33, pCO$_2$ of 126mm.

**Discussion:**

Patients with COPD usually require prolonged mechanical ventilation due to impaired pulmonary functions, high auto PEEP, high airway resistance and hyperinflation of lungs. [1] Weaning from mechanical ventilator is equally difficult due to muscle fatigability and altered gas exchange.[2] Case series and studies by various authors support the use of NIV as a part of an early weaning strategy, when patient fails a trial of spontaneous breathing for patients with COPD.[3,4,5] NIV help the patient by resting the respiratory muscles, improving the breathing pattern and gas exchange. Recent studies have shown that, NIV decreases the duration of ventilatory support, length of ICU stay, incidence of ventilator associated pneumonia (VAP) and improves survival when compared to traditional weaning methods.[4,6]

Our patient had a failed extubation once inspite of satisfying all the criteria for extubation. Prior to extubation, the patient was on minimal pressure support, oxygenating well with minimal O$_2$ and maintained good haemodynamic stability. Therefore, during the second attempt of extubation, we decided to extubate the patient on to NIV and wean her gradually from NIV. Hypercapnoea with metabolic alkalosis are the main acid base abnormality seen in COPD patients with respiratory failure. Even after normalization of PCO$_2$, we commonly come across persistent metabolic alkalosis in these patients.[7] Patients with COPD usually develop metabolic alkalosis during weaning from mechanical ventilation.

Acetazolamide is one of the drug used to treat metabolic alkalosis. Following extubation we started the patient on Tab. acetazolamide 250mg.t.i.d. The drug inhibits the carbonic anhydrase enzyme, mainly in the kidney and red blood cells and induces metabolic acidosis.[8,9]
Hence in our patient we used Tab. acetazolamide for treatment of increased serum bicarbonate.

Metabolic acidosis stimulates peripheral and central chemoreceptors, increasing both minute ventilation and PaO$_2$.[10, 11] Hence acetazolamide would help in weaning COPD patients rapidly from mechanical ventilation. The administration of acetazolamide improves arterial blood gas parameters without significantly changing minute ventilation in spontaneously breathing COPD patients.

**Conclusion**

Extubation on to NIV is an effective ventilation strategy in weaning the patients with acute exacerbations of COPD from mechanical ventilation. We further conclude that, acetazolamide is a useful drug in managing metabolic alkalosis in COPD patient and would also help in weaning the patient rapidly.

**References**