Comparative Effectiveness Of Noninvasive Ventilation vs Invasive Mechanical Ventilation In Chronic Obstructive Pulmonary Disease Patients With Acute Respiratory Failure

Zainab Ali Mukheef,Department of Anesthesiology, I.C.U., Al-diwaneya Teaching Hospital

الخلاصة:

تم اجراء دراسة على 200 مريض مصاب بمرض التهاب القصبات المزمن مع عجز الجهاز التنفسي الحاد في مستشفى الديوانية التعليمي - شعبة العناية المركزة في الفترة مابين شباط 2011 الى شباط 2016 وقسم المرضى الى قسمين:

المجموعة (أ): وتتكون من 100 مريض تم علاجهم بالتنفس الأصطناعي المنتشر عن طريق انبوب الرغامي.

المجموعة (ب): وتتكون من 100 مريض تم علاجهم بالتنفس الأصطناعي غير المنتشر عن طريق قناع الوجه.

وغرض الدراسة هو للمقارنة بين طريقتي العلاج, وكانت النتائج بأفضلية الطريقة الثانية وهي التنفس الأصطناعي غير المنتشر عن طريق قناع الوجه

ABSTRACT:

DESIGN OF STUDY: Retrospective cohort study.

DURATION: From 2011 - 2016

SETTING: Department of Anesthesiology, I.C.U., Aldiwaneya Teaching Hospital.

PATIENTS AND METHODS: Over a period of 5 years, 200 patients with COPD exacerbated by acute respiratory failure, their ages range from 60-80 years, met the chriteria and admitted to the I.C.U. . 100 patients (50%) managed by invasive mechanical ventilation (IMV) (Group A) and the other 100 patients (50%) managed by noninvasive ventilation (NIV) (Group B), both groups with medical therapy (ABC) (Antibiotics,Bronchodilators,Corticosteroids).

RESULTS:

Group **A**: 78 patients (78%) died.
22 patients (22%) improved & discharged to the ordinary ward.

Group **B**: 73 patients (73%) had clinical biochemical improvement & discharged well to the ordinary ward.
27 patients (27%) complicated & needed endotracheal intubation & IMV, after 2-5 days, all died.

CONCLUSION: There is a significant outcome to the use of NIV vs IMV.

KEY WORDS: chronic obstructive pulmonary disease, invasive mechanical ventilation, noninvasive mechanical ventilation, acute respiratory failure.

Introduction:

COPD is a common preventable disease, characterized by persistent airflow limitation that is usually progressive & associated with an enhanced chronic inflammatory response in the airways & the lungs to noxious particles or gases (1). Acute exacerbations of COPD are a frequent cause of admission to hospital and ICU. During these episodes a major deterioration in gas exchange is

accompanied by a worsening in the clinical condition of the patient, characterized by a rapid and shallow breathing pattern, severe dyspnoea, right ventricular failure, and encephalopathy (2). The pathophysiological pathway of all these features is the inability of the respiratory system to maintain adequate alveolar ventilation in the presence of major abnormalities in respiratory mechanics. Hypercapnoea, acidosis, and hypoxaemia all ensue, leading to clinical deterioration in cardiovascular and neurological functions(6).

Three important characteristics of NIV in this setting are worth mentioning. The first one concerns ventilation itself (5). The success of the technique is based on the ability of assisted ventilation (or synchronized ventilation) to improve alveolar ventilation by increasing tidal volume. The widely accepted pressure targeted modes deliver support in synchrony with the patient's inspiratory effort, which usually results in an increase in tidal volume, subsequently associated with a reduction in the amount of effort performed by the patient (3). The ability of these modes to improve the volume delivered to the lung explains the ability of NIV to reverse other clinical and gas exchange abnormalities (8). The second characteristic of NIV is that it is an intermittent mode of support. NIV is usually delivered for only a few hours during a 24 hour period (usually 6-12 hours) and is very rarely delivered as a continuous support. These patients have a highly stimulated and active respiratory drive and can therefore sustain prolonged periods of spontaneous breathing. However, the treatment
should provide a reduction in the amount of effort needed and intermittent support seems to be adequate. The third characteristic of NIV is the use of a face mask in place of an endotracheal tube. Although
the use of these masks is associated with specific problems such as leaks
and limited clinical tolerance, they have been shown to replace endotracheal intubation advantageously as a first line treatment (9).

In a large randomized controlled trial comparing NIV with a standard ICU approach where endotracheal intubation was performed after failure of medical treatment, the use of NIV was shown to reduce complications, length of stay in the ICU approach where endotracheal intubation was performed, the in-hospital mortality rate was nearly 30% which was similar to the 25% of NIV patients who eventually required endotracheal intubation. However, because the number of patients requiring endotracheal intubation was much smaller with the NIV approach, the overall mortality was reduced to less than 10% in patients receiving NIV (4).

Patients & Methods:

From February 2011 to February 2016, 200 patients who are admitted to the ICU with COPD exacerbated by acute respiratory failure. Half of them managed by IMV + medical therapy, Group **A**, the other half managed by NIV + medical therapy, Group **B**.

Mode of ventilation to Group A was CPAP through endotracheal intubation & for Group B was BiPAP through face mask.

Clinical parameters including pulse, respiratory rate, blood pressure, & oxygen saturation (SpO2) are monitored continuously, & arterial gas levels (ABG) are determined 1 and 12 hours after the

start of treatment, and as and when found indicated.

Results:

Group A (100 patients) who were treated with IMV + ABC had mortality rate of 78 %, 78 patients. And the other 22 patients (22%) improved and discharged well to the ordinary ward.

While Group B (100 patients) who were treated with NIV + ABC had better outcome , as 73 patients (73%) improved & discharged well, while 27 patients (27%) needed endotracheal intubation & IMV. 2-5 days after IMV all of them died.

category	*Died*	*Improved*	*Total*
I.M.V	**78**	**22**	**100**
N.I.V	**27**	**73**	**100**
Total	**105**	**95**	**200**

P value <0.00001

This result is very significant.

intubation is the major benefit of NIV (11).

Acidosis is an important prognostic factor for survival after respiratory failure in COPD, and thus early correction of acidosis is an essential goal of treatment. This review has shown that NIV significantly improves pH, PaCO2, and respiratory rate within the first hour. The improvement in pH associated with the fall in PaCO2 indicates an improvement in respiratory failure. A previous study of patients with respiratory failure secondary to exacerbation of COPD showed reductions in respiratory rate and transdiaphragmatic activity, with increases in tidal volume and Thus, NIV not only improves gas exchange but also facilitates respiratory muscle rest, reducing the work of respiratory muscles in respiratory failure, and hence allowing the respiratory muscles to recover and conventional treatment to work (12).

Conclusion & Recommendations:

This study has shown convincing evidence that NIV is an effective adjunct to usual medical care in the management

Discussion:

This study shows a clear benefit of NIV as an adjunct treatment to usual medical care in the management of patients admitted to hospital with respiratory failure secondary to an acute exacerbation of COPD. NIV with usual medical care significantly reduces mortality, endotracheal intubation, treatment failure, complications, length of hospital stay, and blood gas tensions. Although NIV reduces the need for intubation, in some patients NIV will fail, and it is essential that a decision be made with the patient on what should be done in this eventually. Patients for whom NIV eventually fails, despite initial tolerance and effectiveness of the treatment, need to be distinguished from patients who cannot tolerate it at all (10).

NIV reduced the length of stay in hospital by more than 3 days. The number of complications associated with treatment was significantly lower with NIV, with an overall risk reduction of 68%. Almost all of the excess complications occurred because of intubation, suggesting that avoidance of

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of respiratory failure secondary to acute exacerbation of COPD.

Trialing NIV should be considered early in the course of respiratory failure & before severe acidosis ensues, to avoid endotracheal intubation and treatment failure and to reduce mortality.

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