ORIGINAL ARTICLE

Outcome of Invasive Mechanical Ventilation In Advance COPD - A Retrospective Review from a Tertiary Care Hospital in Saudi Arabia

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ABSTRACT

Background: Chronic obstructive pulmonary disease with respiratory failure is frequent cause of admission in critical care units all over the world. Invasive Mechanical ventilation is one of the important management steps in dealing such patient. However this step of management is associated with high mortality and morbidity. In such patient early weaning will reduce the complications associated with invasive ventilation. Weaning failure is frequently seen in chronic obstructive pulmonary disease especially if disease is in advance stage. This is because of various pathophysiological mechanism seen in such patient. The following retrospective review focus on poor outcome in form of increase mortality and morbidity associated with invasive mechanical ventilation.

Design and setting*:* A retrospective review in critical care Unit of King Fahd Hospital Alhassa, Kingdom of Saudi Arabia

Method*:* Fifty patients admitted with respiratory failure due to advance COPD with no other co-morbidities. These patients required invasive mechanical ventilation with different modes. The patients who could be weaned off from mechanical ventilation within 72 hours were put to spontaneous breathing with oxygen for 2 hour trial. Weaning outcome was assessed by re-intubation rate, successful extubation, ventilation dependency, duration on mechanical ventilation, duration in critical care unit and death rate.

Results: 39 patients failed to maintain respiratory parameter of successful weaning and were re-intubated. Out of these 39(78%), twenty five (64%) survived to be able to shift to high dependency unit, of whom 21(54%) were able to be discharged to home after prolong ventilation(>72 hours).Total mortality rate was14(28%), the mortality rate was high(24%) in patient with prolong ventilation(>72 hours). Out of total 33(66%) discharged to home,18(54%) were re-admitted to critical care unit.

Conclusions: Invasive mechanical ventilation is associated with high mortality and morbidity in advance chronic obstructive pulmonary disease (FEV1<30L/mint.) and is of not useful.

Keyword: COPD, Invasive Mechanical Ventilation, Weaning Failure, Respiratory Failure

INTRODUCTION

Invasive positive pressure ventilation (IPPV) is frequently used as part of treatment if other medical therapy fails[1]. In patient with chronic obstructive pulmonary disease presenting with hypercapnic respiratory failure, Bi-positive air way pressure (BiPAP) is the first line noninvasive ventilation if patient is able to tolerate. But still number of patients needs with invasive ventilation in critical care units[2,3].

The use of invasive mechanical ventilation (IPPV)/bi-level positive in patients with COPD presenting with hypercapnic respiratory failure has been recommended in clinical guidelines worldwide[4]. Most of the time in advance COPD prolong ventilation is needed with increase mortality and morbidity with poor outcome and at the cost of useful resources. Frequent use of invasive mechanical ventilation for the management of respiratory failure in COPD has been in turn increased the burden of patients with difficult weaning in Intensive Care Units (ICUs) worldwide. Weaning from invasive ventilation is gradual process is where ventilation is slowly withdrawn and the patient starts his own breathing[5], Sometime it is difficult-to-wean from ventilation and this is defined as ;Those who needs more than 7 days of weaning after first spontaneous breathing trial (SBT)[6]. In patients with chronic obstructive disease who are on IPPV, almost 55% fulfill this criteria[10] showing the importance of delay in weaning in this subgroup of patients, as delayed IPPV is associated with high rate of complications and deaths rate in critical care units. Mortality rate is around 2.6% in patients who are successfully weaned off as compared to much higher at 27% in those who require again intubation re-ventilation[11]. Delayed invasive ventilation (IPPV) is associated with decrease muscle strength and bulk leading to ventilation dependency and increase in the incidence of ventilator-associated pneumonia(VAP). In advance COPD If the weaning is started very early, respiratory failure occurs very frequently. If weaning is delayed for more than 72 hours, it will be unsuccessful because of respiratory muscle wasting and weakness associated with disrupted breathing regulation[12] so weaning time is utmost important predictor of mortality in critical care units. Weaning a advanced COPD patient from IPPV is a continuous struggle which starts with early recognition of patient fulfilling criteria of weaning from IPPV and allowing the patient to breathe on T-piece with oxygen and, if patient tolerates for more than 2 hours and fulfil criteria of extubating. Then face mask oxygen is started after extubation, if T-piece is not tolerated then put the patient on ventilator till next such trial. Before the next trial, patient needs to be evaluated for the possible causes of weaning failure and try to correct in an individual patient (it is difficult wean off –37%). If failure weaning of

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IPPV>3 times or longer than 7 days on ventilator make patients more dependent on ventilator (prolonged weaning –30%). Such patients are more challenging and need some sort of interventions to prevent such patients from becoming permanent IPPV dependent. In few cases home ventilation may be needed for long time with increase mortality and morbidity.

Sometimes our social and religious obligations effect the decision making regarding invasive mechanical ventilation in advanced systemic failure. These decision will burnout the resources at the cost of no benefits rather increase mortality and morbidity. This needs that patients and their relatives should be counselled extensively regarding the outcome and to follow the international guidelines.

The objective of the study was to determine the outcome in the form of mortality and morbidity associated prolong Invasive positive pressure ventilation (IPPV) in advance COPD patients with respiratory failure admitted at Intensive Care Unit of King Fahd Hospital Alhasssa, Kingdom of Saudi Arabia

PATIENTS AND METHODS:

This cross sectional study was conducted from 1-June - 2016 to 31 Dec. 2016. During study period patients with advance COPD (FEV1<30L/mints) requiring Invasive Positive Pressure Ventilation (IPPV) due to respiratory failure admitted to critical Care Unit of King Fahd Hospital Alhassa, Kingdom of Saudi Arabia in age group 50-90 years were included for study. Following criteria was used to define the respiratory failure:

Arterial oxygen partial pressure <60mmhg and partial pressure of carbon dioxide values >55 mm Hg and an arterial pH <7.35 on room air

Patient with low Glasgow Coma Scale <13, hypoxemic, and respiratory failure were put on IPPV

After 72 hours patients were assessed for able to be weaned off from Mechanical; ventilation. This was assessed by the following criteria:

- Oxygen level – PaO_2/FiO_2>200 on positive end expiratory pressure (PEEP) <4 cm of H_2O
- Maintaining Blood Pressure – no Ionotropic support
- Glasgow Coma Scale >13
- Good cough reflex
- Respiration – rapid shallow breathing index (RSBI) <100 after 2 min of spontaneous breathing trial.

If patient was fulfilling this criteria is consider ready to wean off, then patient was given T-bar Trial for 2 hours. Again arterial blood gases were done at two hours, if there was worsening in ABG's then these patients were again put on Mechanical Ventilation (IPPV). This showed weaning failure. These patients were followed up on daily basis and their assessment to be weaned off .Sometime it becomes very difficult-to-wean from ventilation and this was defined as:

Patients who needs more than 7 days of weaning after first spontaneous breathing trial (SBT).[6]

Complications in the form of delayed weaning, ventilator associated pneumonia, duration of ventilation, cardiopulmonary arrest, number of weaning trial were recorded

Data Collection: Demographic and baseline clinical data was collected from patients before being put on IPPV. The information was obtained about age, gender, pH, GCS, PO2, PCO2, RR, Bicarbonate etc.

The information about arterial blood gases was again taken from patients two hour after receiving ventilation with IPPV. The data was recorded in a structured Performa and then entered into SPSS 16. Arterial blood gases were compared before and after IPPV ventilation in both Groups with reference to their Glasgow Coma Scale (GCS) Effectiveness of BiPAP), Mean and SD were calculated for quantitative variables. Paired `t' test and Chi-Square test were applied for comparison of relevant parameters.

RESULTS

In this study, 50 patients were included. The study observations are as follows: The mean (SD) age of study cohort was 69.8(9.30) years with an age range of 40-90 years .The present study cohort has a male preponderance. On admission, Out of total 50 patients, 11(22%) patients were able to tolerate two hours trial of early weaning (within 72 hours. These patients were able to be transferred to high dependency units. These variables were also compared in patient with who failed two hours weaning trial and re-intubated and put on IPPV

Table 1: Demographic and Baseline characteristics of study in term of early weaning from IPPV

Variables	Successful 2 hours T-Bar Trial (n = 50)	Successful 2 hours T-Bar Trial (n = 11)
Age (years)	69.8 ± 9.30	65.7 ± 5.03
Sex	Male = 38 Female = 12	Male = 8 Female = 03
Respiratory rate/mints	28.05(3.43)	21.0 (2.48)
PH baseline	7.21(.032)	7.38(.03)
PaCO2 baseline (mmHg)	71.5(2.38)	41.0(1.22)
PaO2 baseline (mmhg)	53.3(2.48)	75.5 (4.85)
Bicarbonate base line	35.02(1.86)	28.2(1.65)

39(78%) patients were re-ventilated due to weaning failure after 72 hours

Table 2: Comparison of patients clinical parameters with successful and failedweaning from IPPV after 72 hours

Clinical Parameter	Successful Weaning Mean±SD	Failed weaning Mean±SD
Respiratory Rate	20.7 4.33	30.2 6.99
pH value	7.39 .02	7.21 .05
PCo2 (mmHg)	40.2 6.23	65.3 14.7
PO2 (mmHg)	74.3 4.81	54.2 9.3
Serum Bicarbonate mg/dl	27.8 2.93	33.1 1.66

Paired t test with level of significance at P<05

39(78%) patient failed first weaning trial. In these 39(78%) patients median length of stay on IPPV was 22 days.it was longer in patients with FEV1<30 L/mints. Out of these 39(78%) only 25(64%) were survived to discharged. Mortality rate of patients with prolong ventilation was 36% (14 patients died). Out of all patients transferred to ICU and put on IPPV mortality rate was 28%.

Table 3: Factors influencing Mortality

	Early discharge (n=11)	**Late Discharge (n=39)**
Average Duration of stay in ICU	2	22
Average FEV1 Liter/Mints	29	20
Mortality rate in ICU	0%	14(36%)
Ventilator associated pneumonia (VAP)	1(2%)	8(16%)
Pneumothorax	1(2%)	8(16%)
Bed Sores	0%	3(6%)
Sepsis	0%	2(4%)

Patients with very advanced COPD with FEV1<25L/mints were more likely to develop complications in forms of ventilator dependency (78%) and with high mortality (36%). Weaning success was highest for patients with chronic obstructive pulmonary disease with FEV1around 30% or more. Median survival after discharge from unit was 6 months (interquartile range 5–74), with the longest survival seen for patients discharged without domiciliary oxygen.

DISCUSSION

In this study examines we calculated the prognosis during long-term invasive home mechanical ventilation in advance COPD with poor outcome. This is associated with increase mortality and morbidity with no benefits. Sometime our social and religious obligations effect the decision making regarding invasive mechanical ventilation in advanced systemic failure. These decision will burnout the resources at the cost of no benefits rather increase mortality and morbidity.

The most of chronic lung disease has already been classified as a significant predictor of mortality and has been shown to increase effect on resources allocation in long-term care facility.In our study, 36% of the persons dies on invasive ventilation because of advanced COPD (mainly after weaning failure after intubation because of acute exacerbation) and average of 22 days stay on ventilator. Pierson DJ[1]. History and epidemiology of noninvasive ventilation in acute-care setting. respiratory care unis showed 28% mortality associated with invasive ventilation and that was directly proportionate to duration of stay on Ventilation. The little difference may be because of trained staff and availability of urgent needed logistics

Mortality rate r in patients with invasive home mechanical ventilation are rarely explained in the different studies but all literature showed poor outcome in advanced COPD . In a mixed population of patients with COPD either invasive or noninvasive ventilation the duration of ICU mechanical ventilation was 12 ± 2 days , indicating that survival is directly proportionate with duration of stay on Ventilation[(16-17)]Thus, survival over 6 months with invasive ICU mechanical ventilation seems to be poor. In one study[18] Cook D, Rocker G, Marshall J, et al. Withdrawal of mechanical ventilation in anticipation of death in the intensive care unit about 20% of patients receiving invasive mechanical ventilation died due to ventilation being withheld. The decision to withdraw ventilation because of ventilator dependency is also very difficult especially in our religious and cultural backgrounds. And also to prolong life with the initiation of out-of-hospital is difficult due to poor logistics. When it comes to weaning failure is almost exclusively made by family members together with nursing staff and physicians[19]. The major factor influencing the mortality in our study was the decision making by doctors in collaboration with families due to religious and cultural backgrounds, which had a negative impact.

We followed these COPD patients on invasive mechanical ventilations in detail. Because, in most cases, the patients which were sent to home after successful weaning, they did not enjoyed good quality of life with frequent episodes of acute exacerbation and re admission. Most frequent cause was unexpected oxygen desaturation followed by an increase in respiratory secretions. The re-admission rate within one month was 37% in our study as compared to Smedira NG, Evans BH, Grais LS, et al[19]. Demonstrating 24% re-admission rate within one month after successful weaning and then again making difficult situation of decision making about mechanical ventilation. Moreover, patient and family decision requires that frequent meetings regarding decision making in invasive ventilation.

Analysis of the interventions by doctors depends on decision of family members in cases of emergency situation of advance COPD. Our study showed that the most frequent action was the administration of ventilation either invasive or non–invasive under effect of social or religious issue and may not following the international guidelines. Which was indeed associated with high mortality and morbidity with no benefits overall in health management system.

Summarizing these results, hospital ventilation may be organized in a safe manner by specialized doctors, expert family councilors. The resources itself seems to be safe, if ventilator dependency (78%) in advance COPD is avoided by early and effective counselling and advance directive made by patients and their family members[20]. ·Nevertheless, all patients requiring ventilation should be closely monitored with pulse oximetry and severity of COPD with spirometry (FEV1).

Decision for patients with invasive mechanical ventilation should organized as advance directive by a specialized system[21] .In our study, by a slight majority, more patients were not having any advance directive regarding decision of invasive ventilation (98%) and no legal proxy available (0%). All decisions were made mutually by doctor and family under influence of religious and cultures values.

CONCLUSIONS

Sometime our social and religious obligations effects the decision making regarding invasive mechanical ventilation in advanced systemic failure especially in advance chronic obstructive pulmonary disease (FEV1<30L/mint.) at the

cost of no benefits rather high mortality and morbidity. This needs that patients and their relatives should be counselled extensively regarding the poor outcome of this type of ventilation in advance COPD and these decision should not affect the international guidelines.

Conflict of Interest: None declared

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