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Case Report

Use of Assist Control Ventilation and Sedation in Improving Oxygenation in an ARDS Patient - A Single Case Report

Abhishek V Vaidya[1]* and Shaila S Kamath[2]

[1]Assistant Professor (Senior Scale), Department of Respiratory Therapy, Kasturba Hospital, Attavar, Kasturba Medical College, Mangalore, MAHE (Manipal Academy of Higher Education), Karnataka, India

[2]Professor and Head, Department of Anaesthesiology, Kasturba Hospital, Attavar, Kasturba Medical College, Mangalore, MAHE (Manipal Academy of Higher Education), Karnataka, India

***Corresponding Author**: Abhishek V Vaidya, Assistant professor Senior Scale, Department of Respiratory Therapy, Department of Anaesthesiology, Kasturba Hospital, Attavar, Mangalore, India.

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Abstract

ARDS is a restrictive lung disease which is challenging for every clinicians working in intensive care units. ARDS can be treated with mechanical ventilation with proper antibiotics, use of effective sedation and steroids. We emphasize on using assist control mode of ventilation with proper dose of sedation to improve oxygenation, reduce the work of breathing and improve the prognosis of an ARDS patient admitted in intensive care unit.

Keywords: *Mechanical Ventilation; Assist Control Mode; Sedation*

Abbreviations

ARDS: Acute Respiratory Distress Syndrome; PC-SIMV: Pressure Control Synchronized Intermittent Mandatory Ventilation; PC-AC: Pressure Control Assist Control; ECMO: Extracorporeal Membrane Oxygenation; APRV: Airway Pressure Release Ventilation; ABG: Arterial Blood Gas Analysis; peep: Positive End Expiratory Pressure; PSV: Pressure Support Ventilation; Fio2: Fraction of Inspired Oxygen; PaO2/FiO2: Partial Pressure of Oxygen in Arterial Blood Divided by Fraction of Inspired Oxygen Ratio

Introduction

ARDS is a restrictive lung disorder which affects the lung parenchyma including alveoli. There are pulmonary as well as non-pulmonary causes which leads to ARDS.

ARDS is managed by selecting the conventional modes as well as newer modes of ventilation. Assist control mode with sedation has been shown to improve the oxygenation in an ARDS patient.

Prone position ventilation, High Frequency Ventilation ECMO APRV, are the newer strategies of ventilating a ARDS patient.

The following case report describes how assist control mode of ventilation and sedation can improve oxygenation and chest X-ray in an ARDS patient.

Case Presentation

A 37 year old gentleman who was apparently well 5 days back came to causality with complains of fever, headache, body ache for 5 days, cough vomiting breathlessness decreased urine output abdominal pain and loose stools for 1 day. He was treated in a local hospital for 5 days before he was referred here and was diagnosed to have leptospirosis induced ARDS. Patient was presented with a history of alcohol consumption for a long time. Patient was transported with oxygen cylinder on trolley and was received in ICU and then was connected to 60% venturi with 15 l/min oxygen flow. Patient presented with acute breathlessness and marked desaturation.

An ABG was sent on 60% venturi showed a PH- 7.3 PaO_2 - 65 $PaCO_2$- 30 HCO_3 - 23. P/F ratio was 65 / o.6 = 108 which shows poor oxygenation.

A decision was made to intubate the patient in view of altered sensorium, poor oxygenation on ABG and respiratory distress. Therefore patient was intubated with an 8.5 mm id tube and was fixed after B/L air entry confirmation. Day 1 on ventilator Patient was put on PC SIMV on FiO_2 - 1.0 PEEP/PSV- 8/14cm H_20, pressure control of 20cm H_20, and respiratory rate of 15 b/min. Chest X-ray was taken immediately after initiating mechanical ventilation.

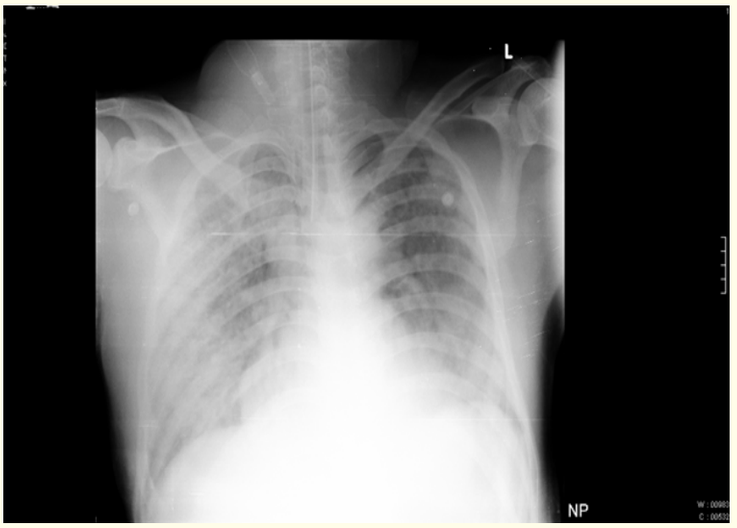

Figure 1: *Showing b/l fluffy infiltrates, reduced lung volumes s/o ARDS.*

Day 2 SIMV mode was continued. ABG was taken on second day on Pressure control SIMV mode which showed PH -7.20, $PaCO_2$ - 48, PaO_2 - 68 and HCO_3 - 16.8, PaO_2/FiO_2 ratio - 68/1 = 68 which shows very poor oxygenation, ABG report reveals Mixed acidosis.

As the patient was not improving on SIMV mode of ventilation. Assist Control mode was selected in view of poor oxygenation and increased work of breathing.

Sedation (Morphine + Midazolam 4 ml/hr) was started in view of patient ventilator asynchrony.

Patient was ventilated with Pressure assist Control ventilation.

Day 3 and Day 4: Patient on assist control mode of ventilation with following settings. Rate - 20 b/min P control - 20 cm H_20 Peep -8cm H_20 FiO_2- 1. Vital signs were normal, patient ventilator synchrony was better and spontaneous rate reduced thereby reducing the work of breathing. Patient tolerated assist control well throughout these two days. ABG was taken on after two days on Assist control mode of ventilation.

Arterial blood gas results showed PH- 7.35, $PaCO_2$ - 32, PaO_2 - 327 and HCO_3 - 21.8. PaO_2/Fio2 ratio - 327 /1 = 327 which showed good oxygenation ABG reveals normal acid base status.

Chest X ray was taken on assist control mode which showed dramatic improvement

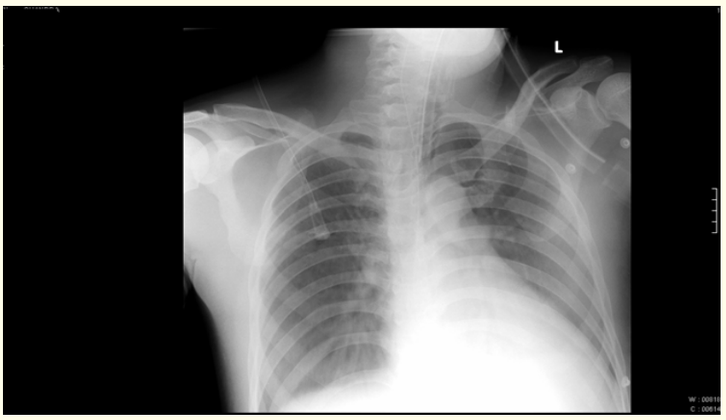

Figure 2: *Chest x ray showing reduced infiltrates and increased lung volumes.*

Day 5 - FiO_2 was reduced to 0.6 and further decreased to 0.4 Rate was reduced to 10 b/min.

Day 6 - Peep was reduced from 8 to 5 cm H_20.

Day 7 - sedation requirements were also reduced and patient was put on pressure support mode of ventilation with peep/PS of 5/10 cmH_2O Spontaneous rate was 20 b/min patient was generating adequate tidal volumes of 400ml.

A decision was made to extubate the patient. Same day afternoon patient was extubated and put on 40% venturi with 10 l/min oxygen flow. Vital signs monitored were normal at this time and Patient was shifted to the tertiary ward.

Discussion

It was a difficult challenge to ventilate the ARDS patient on SIMV mode of ventilation. As the patient showed signs of patient ventilator asynchrony, increased work of breathing and subsequent desaturation. Patients with ARDS often become restless due to the underlying lung condition that makes oxygenation and ventilation worse. That was the reason to implement the use of assist control mode of ventilation with sedation. (Morphine + Midazolam) to improve patient's oxygenation and ventilation. The combination of assist control mode with sedation dose does not allow the patient to take spontaneous breaths, thereby reducing the work of breathing and finally improves oxygenation in an ARDS patient. The combination of assist control mode with sedation definitely is an asset in an ARDS patient. This was the case which was managed on conventional mode of ventilation along with sedation support [1-10].

Conclusion

In a restless patient with ARDS oxygenation can be improved by sedation and assist control ventilation.

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