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COVID-19 Management Protocol

Mohammed D Al Yami

Bellarmine University, USA

*Corresponding author
Mohammed D Al Yami, Bellarmine University, USA.

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Background

Coronavirus disease 2019 (COVID-19) is an ongoing global threat that is associated with high risks of infection, morbidities, and mortalities. The majority of patients with severe COVID-19 disease often present with acute respiratory distress syndrome (ARDS). ARDS associated with COVID-19 represents viral pneumonia with two processes, which includes viral pneumonia that eventually leads to ARDS [1]. Patients who develop ARDS present with worsening respiratory symptoms, hypoxemia, and bilateral lungs diseases, which eventually may result in cardiac failure. The prevalence of ARDS in COVID-19 patients is high, accounting for up to 42% of the patients [1]. Up to 61-81% of the patients who develop ARDS require intensive care [1]. This article will describe evidence-based approaches that have been used for the management of ARDS in critically ill patients with COVID-19

Intubation and Mechanical Ventilation

All patients who develop severe respiratory distress with hypoxemia require the institution of endotracheal intubation and mechanical ventilation. The goal of treatment is to improving ventilation/perfusion mismatch; Recommendations for ventilator management include tidal volumes volume should be 4-8ml/kg ideal body weight in order to avoid resorption atelectasis. Initially, Positive End-Expiratory Pressure (PEEP) levels should be between 8-10 cmH_2O, and the respiratory rate should be kept below 20 breaths per minute [2]. In patients with moderate and severe ARDS, a higher PEEP of > 15cmH20 is recommended in order to maintain the required SpO_2 between 88-92% [3].

For patients presenting with worsening lung damage, recommendations for lung protective ventilation include PEEP level of less than 10 cmH2O, low tidal volume of 6 ml/kg ideal body weight [2]. In order to avoid poor tissue perfusion, the fraction of inspired oxygen (FiO_2) FiO_2 should be minimized to achieve SpO2 guidelines for patient; target driving pressures 13-15, and target plateau <30cmH_2O [2].

Conscious Proning Position

Prone positioning should always be instituted in patients with ARDS, unless contraindicated. Prone positioning is always contraindicated in patients who have an unstable spine, and also in patients with an open abdomen or chest [4]. Prone positioning is important in patients with ARDS because it results in improved hypoxemia [5]. Prone positioning decreases ventilation/perfusion mismatch. Promotes alveolar recruitment and minimizes overinflated lung areas [2].

According to the prone ventilation is recommended for 12-16 hours in adults with severe ARDS [3]. This will result in a decrease in pleural pressure gradient in the lung regions. This occurs because the positioning results in the conformation of the shape matching of the lungs within the chest cavity and increases the gravitational effect [5]. Therefore resulting in improved V/Q matching, reduced pulmonary shunting, recruitment of basal alveoli and improved secretion clearance [5].

Mechanical Ventilation

It is critical to monitor COVID-19 patients for early stages of respiratory fatigue; Failure to immediately respond to this may result in the patient development of impaired respiration, reduction in mental status, and worsening of respiratory acidosis, which may result in severe morbidities and risks of death. If patients are diagnosed with symptoms of respiratory fatigue, then mechanical respiration is recommended and should not be delayed.

Patients with mild to moderate hypoxemia and dyspnea may require the use of a low-flow nasal cannula [2]. However, if they fail to respond to the low flow nasal cannula, then prone positioning is recommended and the use of high flow nasal cannula [2]. Patients should receive a continuous evaluation in order to detect if the patient has deteriorating symptoms, which include severe respiratory distress and rapid progression to ARDS, which requires intubation [2]. To assess for risks of severe respiratory failure, the Cabrini Respiratory Scale (CRSS) may be used to identify the need for a higher level of ventilator support. The CRSS measures respiratory rate, retraction/accessory muscle use and overall state to establish the severity of respiratory distress, with patients scoring 6-10 indicating severe respiratory distress [6].

Airway Pressure Release Ventilation Mode

Airway pressure release ventilation (APRV) is considered early in patients with moderate to severe respiratory distress. The goal of using this approach is to ensure that there is adequate r alveolar recruitment [2]. APRV has been shown to reduce ventilator-induced lung injury and reduce patient-ventilator asynchrony, preventing damage to fragile lung tissues [2]. Additionally, the use of APRV may result in a shorter duration of mechanical ventilation, improved oxygenation, and decreased plateau pressure in ARDS patients [2].

Pulmonary Vasodilators

Vasodilators play a huge role in the management of ARDS in patients with COVID-19 diagnosis. It has also been shown to correct hypoxemia by decreasing shunt fraction by redistributing blood from poorly ventilated areas to well ventilated area [2]. Use of this adjunct therapy may improves oxygenation in the management of COVID-19 [2].

The preferred pulmonary vasodilators include the use of inhaled vasodilators as compared to intravenous vasodilators because of their action in the pulmonary circulation damage [7]. An example is the use of inhaled nitric oxide (INO), which has been shown to improve oxygenation as it is quickly metabolized into nitric acid, hence reducing inflammatory cell-mediated damage [7]. Additionally, studies have shown the effectiveness of intravenous nitroglycerine solutions and inhaled prostacyclin and milrinone; however, INO has been shown to be more effective [7]. The vasodilators improve oxygenation, lowers pulmonary vascular resistance, and decrease alveolar edema. They should be utilized early with or without mechanical ventilation [4].

Extracorporeal Membrane Oxygenation

Extracorporeal Membrane Oxygenation (ECMO) is indicated in patients with severe respiratory failure with refractory hypoxemia [3]. According to, however, there are contradictory views of the benefits of ECMO [2]. ECMO is indicate if the the patient develops worsening refractory hypoxemia, which is indicated by (PaO_2/FiO_2 ratio < 80 mmHg for > 6 h, or PaO_2/FiO_2 ratio < 50 mmHg for > 3 h). Additionally, failure of other conventional treatments may be an indication for ECMO [2].

Conclusion

In conclusion, severe COVID-19 disease often presents with severe ARDS, which is a significant cause of hospitalization and mortalities. There is currently no treatment for COVID-19, therefore, treatment focuses on the management of symptoms Symptom management varies based on the severity of the disease. However, a multidimensional approach that includes both non-pharmacological and pharmacological approaches is crucial for better patient outcomes. It is crucial to note that patient assessment and monitoring of symptoms are important for better outcomes. Regular assessment is linked with early identification of deteriorating symptoms and hence prompt intervention.

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