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Review Article

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Prone Position during Mechanical Ventilation

Mohammed Al Yami*

Senior Specialist Respiratory, Bellarmine University, Saudi Arabia

***Corresponding author:** Mohammed Al Yami, Senior Specialist Respiratory Therapist, Respiratory Therapy Leadership, MHS Bellarmine University, Registered Senior Respiratory Therapy (RRT) at KFGHJ on MOH, Lecturer in Respiratory Therapy, Jeddah, Makkah, Saudi Arabia.

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Acute respiratory distress syndrome (ARDS) is characterized by the rapid onset of inflammation in the lungs. Its symptoms include rapid breathing, shortness of breath and a bluish coloration of the skin as a result of reduced oxygen levels and hypoxemia. ARDS is caused by infections such as pneumonia, pancreatitis and sepsis, and trauma. It inhibits the gaseous exchange process in the lungs of a patient, reducing oxygenation levels [2]. The primary treatment of ARDS involves Intensive Care Unit (ICU) and mechanical ventilation to increase the oxygenation levels. Mechanical ventilation is carried out through endotracheal intubation or tracheostomy to maintain acceptable oxygen levels in a patient's body. The oxygenation of one is necessary to meet the body's metabolic demands and reduce the mortality risk that is associated with the disease. *Setten, Plotnikow & Accoce* (2016) [4] note that ARDS is associated with high resource consumption, financial and neuro-psychological consequences and increased risk of mortality. In the care of mechanically ventilated patients in the ICU, positioning is important in reducing the development of ventilator-associated infections. Positioning influences the respiratory mechanics by altering the chest wall components, resistance and compliance of the respiratory system and the static lung volume [2]. Supine or lateral positioning, for instance, are not beneficial to the patients as they may impair the respiratory mechanics. However, prone and inclined sitting positioning are associated with improved functional residual capacity (FRC), enhanced oxygenation and eased breathing, and these have beneficial effects to the patients [1].

Prone positioning has been used in improving the outcomes of mechanically ventilated patients with ARDS in the ICU. Besides improved oxygenation and gaseous exchange in the patients, prone positioning has been shown to maintain the FRC of the lungs at an average of 2.4L, unlike supine and sitting positions that have been shown to reduce it from 2.9L to 2.1L in ventilated patients. The im proved FRC is because it allows the lung to fit well into the chest cavity, reduces the effects of gravity along the vertical gradient as well as the compression of the lungs as a result of the weight of the heart and mediastinum [1]. The reduced compression of the lungs results from the fact that the anterior chest lies on the mattress, thereby receiving some of the pressure. The reduced compression subsequently results in increased chest elasticity that increases gaseous exchange and oxygenation in a patient. In addition, the prone position reduces the trans-pulmonary pressure and the strain of the lungs and chest cavity.

Different studies that have been carried out have shown the effectiveness of prone position in improving oxygenation and gaseous exchange in mechanically ventilated patients with ARDS, thereby improving the patient outcomes. For instance, *Guerin* (2017) conducted a systematic review of randomized clinical studies to determine whether prone positioning increased patient survival and outcomes as a result of improved oxygenation levels, among ARDS patients who were mechanically ventilated. The relevant studies were obtained from different databases including PubMed, Cochrane and Lilacs with the use of different MeSH terms that were combined to give the articles. A narrative review was used to show the physiological modifications that were associated with prone positioning [1]. The results obtained showed that the patients had increased lung weight and pressure that led to edema and collapse of different lung regions. Nonetheless, prone positioning of the patients led to changes in the elastance and pressure in the lungs, leading to improved patient survival because of increased gas exchange and oxygenation [1]. Also, prone positioning promoted respiratory secretions clearance and prevented the development of ventilator-associated pneumonia. *Guerin* (2017) concluded that

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prone positioning in mechanically ventilated patients improves patient outcomes and should be used as a first line therapy along with neuromuscular blocking agents in ARDS.

In another study, *Munshi, et al*. (2017) conducted a study to evaluate whether prone positioning of mechanically ventilated patients with ARDS reduced the 28-day mortality when compared to patients in the supine position. Studies for inclusion were retrieved from different databases including MEDLINE and EMBASE and included randomized controlled trials. Sensitivity analyses that assessed the effects of the duration and prone ventilation on the severity of the disease were carried out [3]. Eight studies that met the inclusion criteria were included. A meta-analysis indicated that there were no differences in the mortality rates between patients who had severe ARDS and 12-hour or longer duration of prone ventilation [3]. However, the positioning was associated with reduced mortality rates, although it led to the development of pressure sores and endotracheal tube obstruction. *Mushi, et al*. (2017) concluded that prone positioning of mechanically ventilated patients with ARDS leads to improved outcomes.

In summation, the treatment of ARDS involves mechanical ventilation of patients to increase their rates of oxygenation and gaseous exchange. The positioning of the patients significantly influences the respiratory mechanics as it alters the lung volume and pressure, and elasticity of the chest wall, further influencing the patient outcomes. However, prone positioning of the patients improves their outcomes and survival, as it increases the emptying and secretion of abdominal contents, reduces lung pressure and leads to sustained oxygenation.

References

1. Guerin C (2017) Prone positioning acute respiratory distress syndrome patients. Annals of translational medicine 5(14): 289-296.
2. Mezidi M, Guerin C (2018) Effects of patient positioning on respiratory mechanics in mechanically ventilated ICU patients. Ann Transl Med 6(19): 384.
3. Munshi L, Sorbo L, Adhikan N, Carol L Hodgson, Hannah Wunsch, et al. (2017) Prone position for acute respiratory distress syndrome: A systematic review and meta-analysis. Ann Am Thorac Soc 14(4): S280-S288.
4. Setten M, Plotnikow G, Accoce M (2016) Prone position in patients with acute respiratory distress syndrome. Rev bras ter intensive 28(4): 452-462.