

An exploration of oxygenation indices in prone patients

David M. Hannon

Introduction

The Acute Respiratory Distress Syndrome (ARDS) was initially identified as a clinical entity in the 1960s¹. Pathophysiologically, ARDS consists of diffuse alveolar damage due to the activation of alveolar macrophages to release pro-inflammatory cytokines² that attract neutrophils to the lungs where they damage the alveolar and capillary epithelium by release of toxic mediators. This leads to the alveoli being filled with bloody, proteinaceous fluid. Consequently, the surfactant can no longer support the alveoli³. The end result is that these damaged alveoli lead to impaired gas exchange, which is the pathophysiologic hallmark of ARDS.

Patients with certain clinical conditions are at higher risk for developing ARDS. These can broadly be grouped into direct lung injury risk factors like pneumonia, aspiration, pulmonary contusion, inhalational injury, near drowning etc. (heretofore referred to as 'ARDSp') and indirect lung injury risk factors such as sepsis, non-thoracic injuries/hemorrhagic shock, pancreatitis, burns, drugs/toxins, blood transfusions, cardiopulmonary bypass and reperfusion injury after lung transplant or embolectomy (which will now be referred to as 'ARDSexp')⁴.

To date, there are no specific drugs or therapies available to directly treat/prevent ARDS. Mechanical ventilation that aims to protect injured lungs and minimize Ventilator Induced Lung Injury (VILI), and management of refractory hypoxaemia, are the keystones in supportive management of ARDS⁵. Part of the above can include placing a patient in the prone (i.e. 'face down') position. This was first described as a therapy for ARDS in the 1970s⁶. The mechanism by which prone positioning improves oxygenation is multifactorial. It reduces the ventral to dorsal transpulmonary pressure difference, ventilation-perfusion mismatch and lung compression^{7,8}. Other potential physiological effects of prone positioning include a decrease in proinflammatory cytokines and improvement in RV dysfunction by preserving pulmonary circulation⁹.

The first prospective randomized control trial (known as the 'PROSEVA' trial) that showed a mortality benefit from prolonged prone positioning was conducted in France and published in 2013¹⁰. Earlier randomized control trials failed to show significant mortality benefit, which was likely due to inconsistent use of lung protective ventilation, shorter duration of prone positioning and application of prone positioning in patients with mild-moderate ARDS¹¹. Prone positioning for at least 12 to 16 hours per day, while administering low tidal volumes (4-6ml/kg of ideal body weight), is now strongly recommended in ventilated patients with severe ARDS¹².

Many questions regarding the utility and efficacy of the prone position remain. An impor-

tant issue lies in identifying patients who, although they fit the criteria to undergo prone positioning, are unlikely to receive a mortality benefit and in whom other therapies may be effective¹³.

Population

Oxygenation indices

Explorations & Comparisons

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