Managing COVID-19 ARDS

Developed by Anne Dabrow Woods, DNP, RN, CRNP, ANP-BC, AGACNP-BC, FAAN

Patients with severe symptoms of COVID-19 pneumonia often go on to develop acute hypoxemic respiratory failure and some will develop adult respiratory distress syndrome (ARDS) (Auwaerter, 2020). Critical care clinicians have managed ARDS for years; however, COVID-19 ARDS is different from the typical ARDS we’ve known.

Berlin Definition

The severity of the ARDS is defined by the degree of hypoxemia, which is calculated as the ratio of arterial oxygen tension to fraction of inspired oxygen (PaO₂/FiO₂). ARDS can be classified as mild, moderate or severe based on the Berlin definition of ARDS (Ranieri et al., 2012).

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<th>Berlin Definition of ARDS (Ranieri et al., 2012)</th>
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<tr>
<td>ARDS Severity</td>
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<td>Mild</td>
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<tr>
<td>Moderate</td>
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<td>Severe</td>
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*on positive end-expiratory pressure (PEEP) ≥ 5 cm H₂O

It is important to remember that certain variables may impact the PaO₂/FiO₂ ratio, including:
- Chest x-ray severity
- Respiratory system compliance
- Positive end-expiratory pressure (PEEP)
- Corrected expired volume/minute

Lung Compliance

The ability of the lung to expand and recoil is compliance. When comparing traditional ARDS to COVID-19 ARDS, lung compliance is very important. Compliance can be divided into two types:
- Static compliance – lungs not moving and at rest (pressure is the only variable)
- Dynamic compliance – lungs moving during breathing

Certain disease processes affect lung compliance, by either decreasing or increasing compliance:
- Low lung compliance
  - Pulmonary fibrosis, due to collagen build-up which decreases lung elasticity
  - ARDS, due to atelectasis in dependent areas of the lung
- High lung compliance
  - Chronic obstructive pulmonary disease and emphysema, due to elastic recoil damage
  - COVID-19 ARDS, less pressure is needed to inflate the lungs (Gattinoni et. al., 2020)

Interventions for COVID-19 ARDS

Follow the Surviving Sepsis Campaign: Guidelines on the Management of Critically Ill Adults with Coronavirus Disease 2019 (COVID-19).

*Perfusion is equally as important as ventilation.
• Intubate and extubate in a negative pressure room; staff should don appropriate personal protective equipment (PPE), preferably Powered Air Purifying Respirators (PAPRs); minimize number of staff in room.

• Use a low tidal volume (Vt) strategy; Vt 4-8 mL/kg of predicted body weight (most common 6 mL/kg)

• Target plateau pressure of less than 30 cm H₂O; higher levels significantly increase the risk of barotrauma.
  - If plateau pressure is > 30 cm H₂O, decrease PEEP or decrease Vt.

• Use PEEP and Vt needed to oxygenate the blood and ventilate the patient.
  - In mild ARDS, can start with lower PEEP.
  - In moderate to severe ARDS, consider higher PEEP strategy (10 or greater).

• Consider alternative modes of ventilation, such as pressure-limited modes or volume targeted pressure-controlled ventilation (remember, compliant lungs need less pressure).

• Use recruitment maneuvers.

• Proning
  - Consider 12-16 hours/day.
  - Watch for hemodynamic and vent/perfusion instability for 1st hour post proning and placing patient supine.
  - Proning results take longer to see than typical ARDS; results are more due to redistribution of perfusion and gravitational forces (Gattinoni, et al., 2020).
  - Put cables and intravenous lines on one side, when possible.
  - If available, use a proning team.

• Sedation
  - When proning, patients may require additional sedation to tolerate the prone position.
  - If patients continue to have ventilator dyssynchrony despite optimizing ventilator settings and sedation, consider paralyzing the patient.

• Patients decompensate quickly, especially during weaning; use a very, very slow weaning process even if patient appears comfortable on low pressure support (PS) settings.

• Patients are coagulopathic; if using continuous renal replacement therapy (CRRT), consider frequent boluses of heparin versus infusion, or administration of argatroban pre-circuit.

• Consider tracheostomy if the patient is anticipated to be on the ventilator for over 14 days. This is a highly aerosolized procedure so perform it in a negative pressure room. Consider trach teams if the volume of tracheostomies is high.

References:


