

Three parts of talk:

1. Mechanisms of lung injury

- a. Volutrauma (high peak pressures, >30cm H₂O, high tidal volumes)
- b. Barotrauma (also caused by high pressures and alveolar injury also air to escape)
- c. Atelectrauma (damage to “good” alveoli with overdistension by treating “bad” alveoli)

2. Safe lung ventilation strategies

- a. Chest plateau pressures by doing a “pause”; goal <30 cm H₂O but can be higher up to <50 cm H₂O for restrictive physiology (e.g. obesity)
- b. Keep tidal volumes at <8cc/kg of ideal body weight; can fine tune with stress index or driving pressure to prevent volutrauma and barotrauma
 - i. https://www.nejm.org/doi/10.1056/NEJM200005043421801?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%3dwww.ncbi.nlm.nih.gov (NEJM 2000, ARDSnet); In patients with acute lung injury and the acute respiratory distress syndrome, mechanical ventilation with a lower tidal volume than is traditionally used results in decreased mortality and increases the number of days without ventilator use.
- c. Use PEEP-FiO₂ tables for guidance to prevent atelectrauma; consider high PEEP-FiO₂ tables for severe ARDS and low PEEP-FiO₂ for mild-moderate ARDS
 - i. <https://jamanetwork.com/journals/jama/fullarticle/185447> (JAMA 2010); Treatment with higher vs lower levels of PEEP was not associated with improved hospital survival. However, higher levels were associated with improved survival among the subgroup of patients with ARDS.

3. Considerations for escalating therapy in patients with severe ARDS and phenotypes of ARDS with respect to COVID 19

- a. Proning
 - i. <https://www.nejm.org/doi/full/10.1056/nejmoa1214103> (NEJM 2013); In patients with severe ARDS, early application of prolonged prone-positioning sessions significantly decreased 28-day and 90-day mortality.
- b. neuromuscular blockade
 - i. <https://www.nejm.org/doi/full/10.1056/NEJMoa1005372> (NEJM 2010); In patients with severe ARDS, early administration of a neuromuscular blocking agent improved the adjusted 90-day survival and increased the time off the ventilator without increasing muscle weakness.
- c. VV ECMO
 - i. <https://www.nejm.org/doi/full/10.1056/NEJMoa1800385> (NEJM 2018); Among patients with very severe ARDS, 60-day mortality was not significantly lower with ECMO than with a strategy of conventional mechanical ventilation that included ECMO as rescue therapy.
- d. Consider hypoinflammatory (less infiltrate, <15 driving pressures → low PEEP-FiO₂ tables, proning less effective) and hyperinflammatory (more infiltrates, higher driving pressures → standard PEEP-FiO₂ tables, proning, fluid restriction) phenotypes
 - i. [https://www.thelancet.com/journals/lanres/article/PIIS2213-2600\(14\)70097-9/fulltext](https://www.thelancet.com/journals/lanres/article/PIIS2213-2600(14)70097-9/fulltext) (Lancet Resp Med 2014); identified two subphenotypes within ARDS, one of which is categorised by more severe inflammation, shock, and metabolic acidosis and by worse clinical outcomes. Response to treatment in a randomised trial of PEEP strategies differed on the basis of subphenotype.