Preventing Air Leak Syndrome in Mechanical Ventilation

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Scope

- Concept and mechanism of ALS
- Ventilator strategies to prevent ALS
- Medical treatment to reduce ALS
- Classification of ALS
- Management
- ALS in newborn

TABLE 44-2 Possible Mechanisms for "Barotrauma" in Mechanically Ventilated Patients

Airway disruption or alveolar rupture prior to initiation of ventilatory support
Trauma (penetrating or blunt)
Resuscitation (mouth-to-mouth or manual ventilation)
Airway laceration or perforation during intubation attempts
Attempted central line placement (e.g., via the internal jugular or subclavian route)
Biopsy or surgical procedure
Direct laceration of visceral pleura or airway during mechanical ventilation ("pseudobarotrauma")
Central line placement
Thoracentesis or chest tube placement
Transbronchial biopsy or bronchial brushing
"Spontaneous" alveolar rupture
Manifestation of a primary disease process
Complication of ventilator-associated pneumonia or sepsis
Inadvertent alveolar overdistension (e.g., right main bronchus intubation or manual ventilation)
Related to ventilator management per se (e.g., tidal volume, positive end-expiratory pressure, recruitment maneuvers, or breath-stacking)

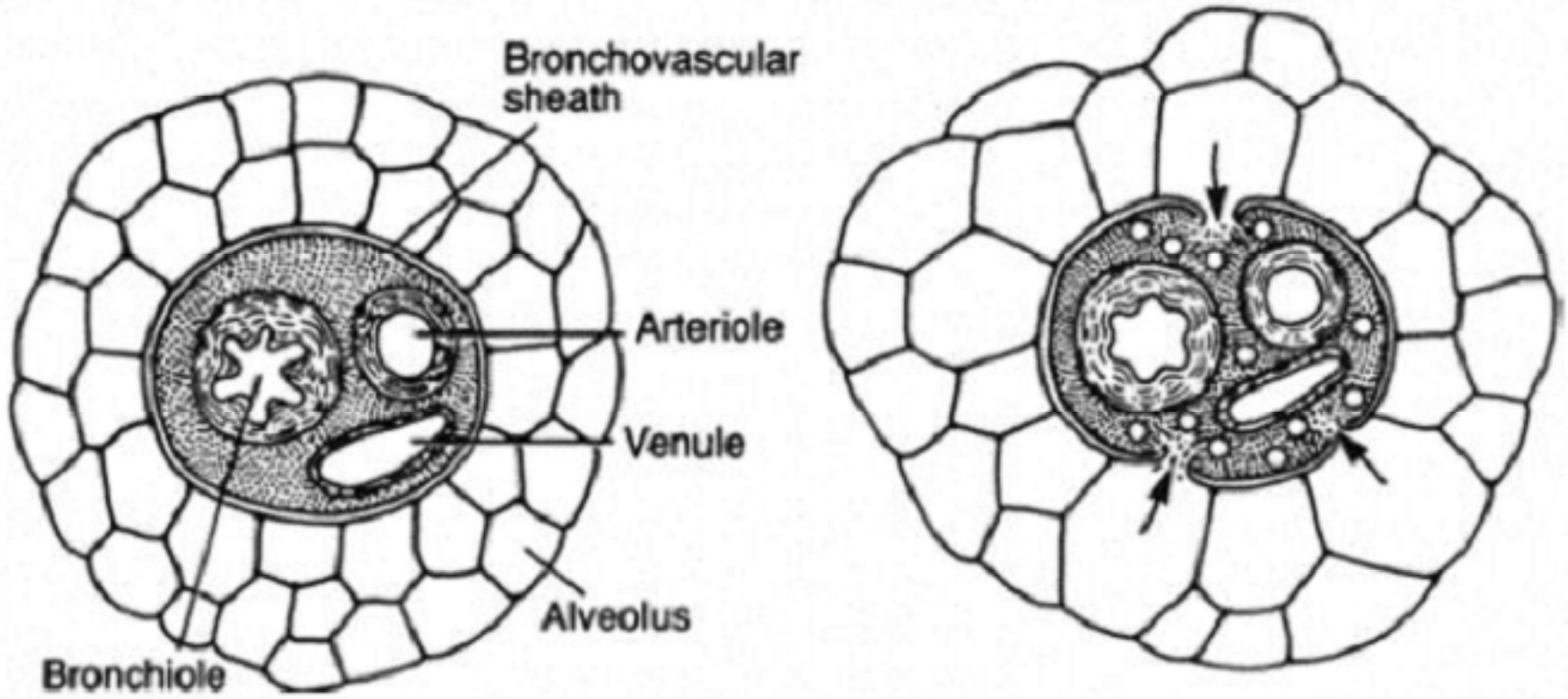

FIGURE 44-1 Mechanism of alveolar rupture during mechanical ventilation. Pressures between adjacent alveoli equalize rapidly, but, especially in the presence of high alveolar volume, increased alveolar pressure in comparison with that in the adjacent bronchovascular sheath establishes a pressure gradient that may result in rupture of the alveolar wall, allowing passage of air into the interstitial tissue of the bronchovascular sheath. (*Reproduced, with permission, from Maunder et al.*[27])

TABLE 44-5 When to Suspect a Pneumothorax in the Ventilated Patient

Clinical change in patient's status
Sudden or progressive increase in inspiratory peak or plateau airway pressure
Hypotension or cardiovascular collapse
Sudden onset of agitation and respiratory distress ("fighting the ventilator")
Chest radiographic findings
General increase in volume of one hemithorax
Deep sulcus sign: downward displacement of costophrenic angle and/or hemidiaphragm
Increase in relative radiolucency of one lung or part of one lung
Clinical settings suggesting high risk for pneumothorax
Use of large tidal Volumes (e.g., >8–10 ml/kg) in patients with acute lung injury or underlying chronic pulmonary disease
Use of high levels of PEEP (e.g., >15 cmH_2O)
High peak airway pressure (e.g., >50–60 cmH_2O), especially if increasing on the same inspiratory flow settings
Acute respiratory distress syndrome (ARDS), especially late in its course (e.g., 2–3 weeks)
Severe underlying obstructive lung disease
Pulmonary infection complicating ARDS