Preventing overdistension and Under-recruitment Injury

“Lung Protective” Ventilation

Add PEEP

Limit VT

Limit Distending Pressure

Pressure

Limit Volume

Volume
The aim of the open lung concept

- To recruit all recruitable alveoli during the opening procedure
- To continue keeping all the recruitable alveoli open
- To maintain adequate gas exchange while minimizing VILI

Pinhu L et al Lancet 2003;361:332
Ware LB et al N Engl J Med 2000;342:1334
The concept of PEEP and Recruitment

Three Types of Recruitment Maneuvers

- Sustained Inflation: 40 for 40 s
- Incremental PEEP: 35 Peak
- Pressure Controlled Ventilation: 45/15 and 1:2 for 120 s
Ventilator induced lung injury

After 20 min
Low pressure MV and ZEEP

After 20 min
High pressure MV and PEEP

After 20 min
High pressure MV and ZEEP
Reversibility of Lung Collapse and Hypoxemia in Early Acute Respiratory Distress Syndrome


Reversibility of Lung Collapse and Hypoxemia in Early Acute Respiratory Distress Syndrome


RM and inflammatory cytokines for lung injuries
Talmor D et al Chest 2007;132:1434
How to ventilate ARDS with HFOV & open lung technique
Pediatrics
- ARDS
- Severe Pneumonia
- Smoke Inhalation
- (Bronchiolitis)
- Acute necrotizing tracheitis

Pediatric airleaks
- Interstitial emphysema
- Subcutaneous Emphysema
- Pneumothoraces
- Post op lung surgery
- Pneumoperitoneum
- Pneumomediastinum
- Broncho-pleural
Biophysical Injury
• Shear
• overdistention
• cyclic stretch

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\Delta \text{intrathoracic pressure}
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\[\uparrow \text{alveolar-capillary permeability} \]
\[\downarrow \text{cardiac output} \]
\[\downarrow \text{organ perfusion} \]

Biochemical Injury (Biotrauma)

cytokines, complement, PGs, LTs, ROS, proteases, bacteria

Epithelium/interstitium

Distal Organ Dysfunction

Mechanical Ventilation
