

Lung Donor Selection and Management: Strategies for Optimizing Organ Function to Increase Lung Utilization

In the United States, there are currently over 1,400 people in need of a donor lung, 20% of whom will die awaiting transplantation. A suggested strategy for increasing donor lung utilization involves an aggressive lung management protocol that incorporates Extreme Pressure Control Inverse Ratio Ventilation (PCIRV). This lung recruitment protocol has resulted in significantly improved donor lung outcomes with no apparent effect on the recipient population.

The Ideal Lung Donor

- ◆ PaO₂/ FiO₂ (P/F) ratio > 300 mmHg
- ◆ A clear chest radiograph
- ◆ Minimal, non-infected tracheal secretions

**In 2018, there were 36, 530 organ transplants. Only 2,530 of those transplants were lung. Of the 10, 721 donors, only 23.7% of them were lung donors. (OPTN Data)*

Reasons for Suboptimal Donor Lung Function

- ◆ Pre-existing conditions such as asthma, smoking, infections, etc.
- ◆ Death-related causes including:
 - Aspiration, Contusions, Fractures, Pneumothorax
 - Head Injury (i.e. Neurogenic Pulmonary Edema)
 - Ventilator induced injury/infection
- ◆ Brain-Death physiology

Optimizing Lung Function

The implementation of lung management protocols lasting longer than 10 hours result in better lung recipient survival.

General Respiratory Goals:

- ◆ Head elevated 30 degrees with the Endotracheal Tube (ETT) cuff inflated to prevent aspiration
- ◆ Early and repeated bronchoscopy (with minimal saline lavage)
- ◆ Utilization of Albuterol and Mucomyst as needed for mucus clearance
- ◆ Chest physiotherapy, suctioning, and positioning every 4 hours
- ◆ Use of adjunct medications such as corticosteroids
- ◆ Maintaining a fluid balance

Ventilator, Blood Gas Goals

- ◆ Normal ventilation and oxygenation
 - ◆ pH 7.35-7.45, PaCO₂ 35-45, O₂ sats >95%
- ◆ Limit Ventilator Associated Complications
 - Oxygen Toxicity
 - ≤ 40% oxygen, the lower the better
 - Barotrauma
 - Plateau <30-35, PIP<35-40, MAPs<20-25
 - Generally, need PIPs in mid 20s for acceptance for transplantation
 - Volutrauma
 - TV 6-8 ml/kg of ideal body weight

Airway Pressure Release Ventilation (APRV) Settings

1. Set P High using the peak inspiratory pressure (PIP) of the previous PC mode or at the peak plateau pressure (pPlat) of the previous VC mode
 - a. A plateau pressure is obtained by performing an inspiratory hold
 - b. Set to a minimum of 20 cmH₂O but avoid exceeding 35 cmH₂O
 - c. Make adjustments in 2 cmH₂O increments to maintain MAP 25-28
2. Set P Low to 0
3. Set T High initially between 4-6 seconds
4. Set T Low initially between 0.5-0.8 seconds
 - a. Set to achieve an expiratory flow rate termination that is 50% of the peak expiratory flow
 - b. Consult RT for assistance
5. Recheck ABG in 2 hours after initial change and then every 4 hours and make adjustments as need to obtain optimal oxygenation and a normal pH

***The first ABG in APRV may be worse than the baseline. Keep in mind that full recruitment may take 4-6 hrs.**



References

The content of this issue is based on a webinar presentation by Samir Latifi, MBBS, FRCPH, FAAP (Chair Department of Pediatric Critical Care, Cleveland Clinic; Associate Medical Director, Lifebanc, Cleveland, OH). A special thanks to Dr. Latifi for his contributions to this in-service. We'd also like to extend a sincere thanks to Dan Lebovitz, MD (Medical Director, Lifebanc) for his contributions to this educational offering.

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