

# Prone position improves lung homogeneity by stabilizing the pleural pressure gradient

Kohei Osada, Bhushan Katira, Luca Bastia, Doreen Engelberts, Felipe Damiani, Takeshi Yoshida, Gail Otulakowski, Martin Post, Laurent Brochard, Brian Kavanagh.



Interdepartmental  
Division of Critical  
Care Medicine



# Background

## Pronation

- Improves Oxygenation
- Improves Survival

---- the mechanism is not entirely understood

# Hypothesis

## Pronation

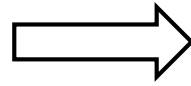
- Reduces the vertical pleural pressure gradient
- Improves ventilation homogeneity

# Methods: Protocol

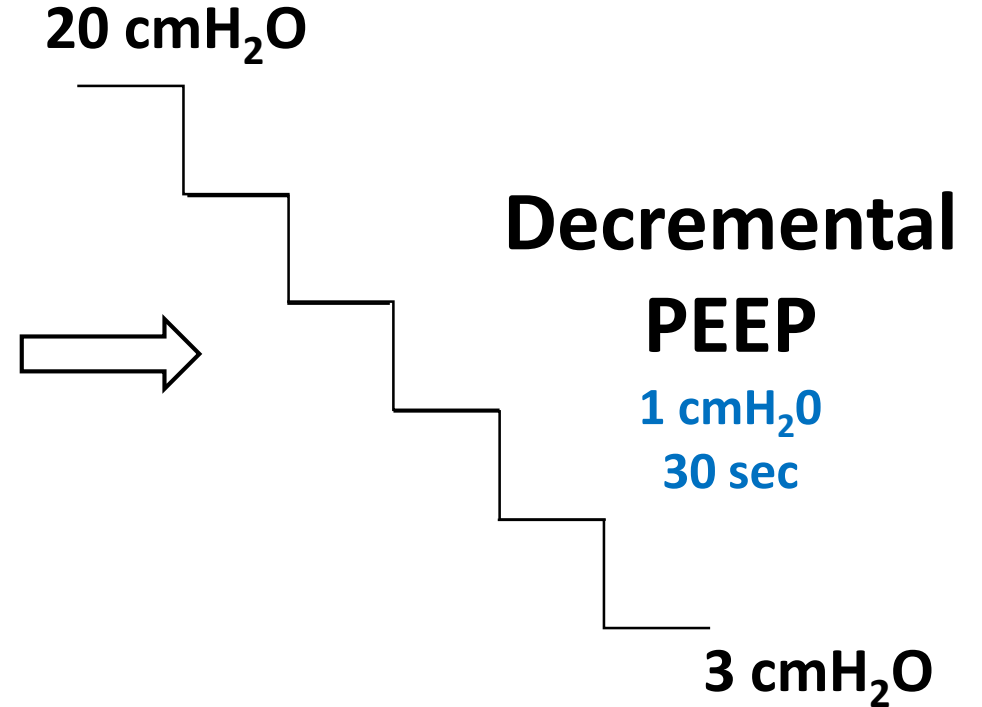
## Porcine model

### ARDS

Lung Lavage  
High Stretch ventilation

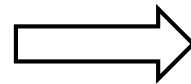


## Supine/Prone crossover



### Measurement:

- Airway Pressure
- Esophageal Pressure
- **Pleural Pressure**
- **Electrical Impedance Tomography**



### Calculation:

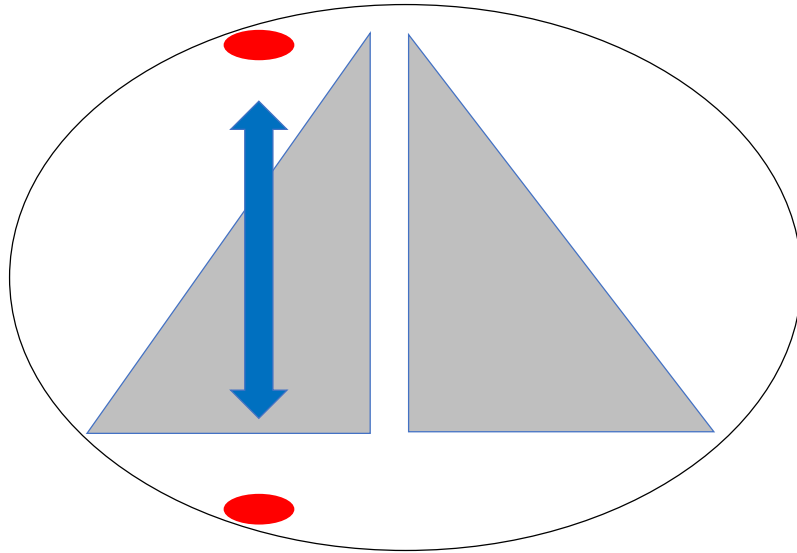
- Pleural Pressure Gradient
- Tidal Distribution
- Regional lung compliance

# Method: Ppl measurement

## Supine

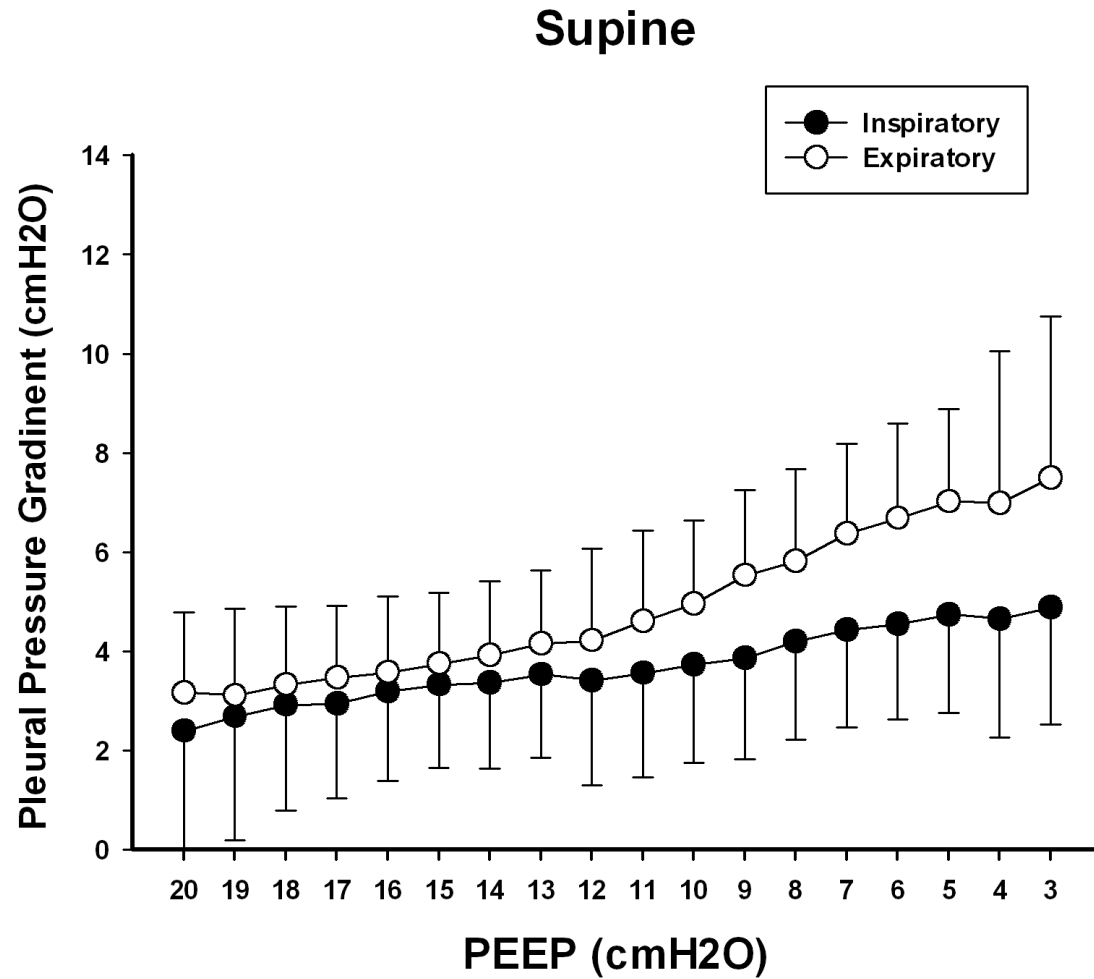
Non-dependent Ppl

Gradient Ppl



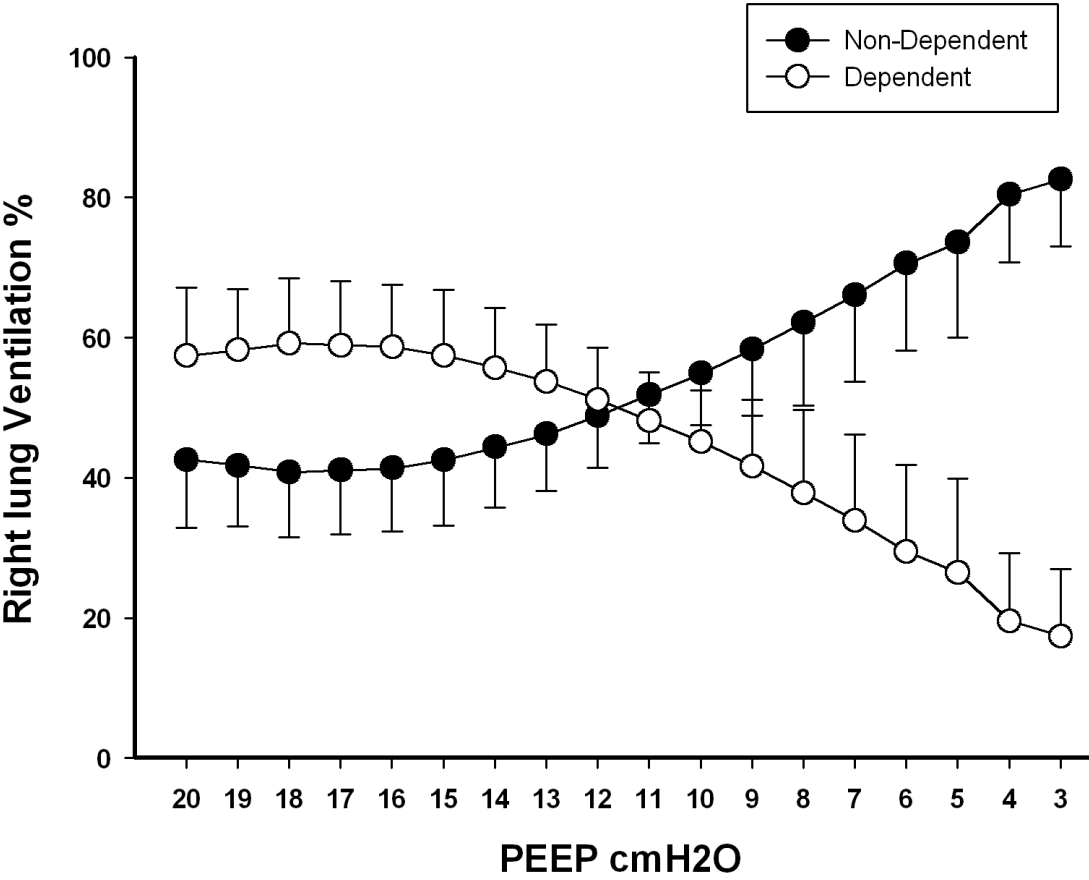
Dependent Ppl

# Vertical Pleural Pressure Gradient (n = 9)



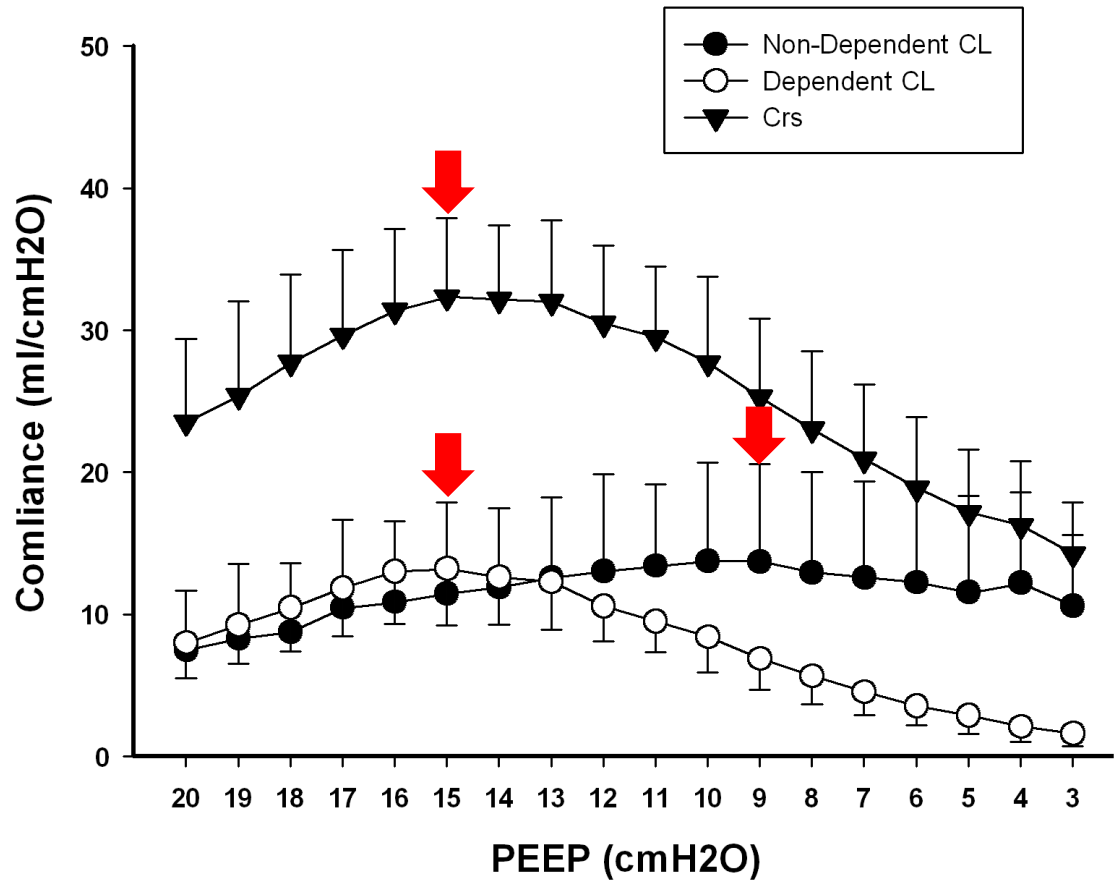
# EIT Tidal Distribution (n = 9)

Supine



# Regional Lung Compliance (n = 9)

Supine



# Conclusion

## Prone position

- **Stabilizes the Ppl gradient across the PEEP**
- **Improves lung homogeneity as seen by regional compliance curves**
- **Enhances the protective effect of PEEP**

**May explain better survival...**





**Brian !**

**It is a privilege to  
work in the lab**

**Many thanks for this  
opportunity**

**Thank you !!!**