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UMONS

How to ventilate patients with obesity



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WGH | WOMEN IN
GLOBAL HEALTH

Disclosure of potential conflicts: Sarah Saxena

- Advisory Board/Clinical Trials/Speaker:
 - Merck MSD
 - Not Employee, No Investments, no Patent in product
 - No important share holder in any medical company.
 - Medtronic
 - Not Employee, No Investments, no Patent in product
 - No important share holder in any medical company.
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- This Lecture is my personal work and opinion.

Post Operative Pulmonary Complications (PPC)

Different names – A combination of different problems?

- ARDS (adult respiratory distress syndrome)
- Barotrauma; Volutrauma; Biotrauma
- ALI (Acute lung injury)
 - VILI (Ventilator induced Lung injury)
 - VALI (Ventilator associated lung injury)
- Postoperative Respiratory failure
 - Aspiration pneumonia, silent aspiration, pneumonia
 - Pneumothorax
- Lung atelectasis after mechanical ventilation
 - Postoperative hypoxia (hypoventilation, stop breathing)

Ventilating the patient with obesity: the 4/4 cake approach



4/4 Cake Recipe



1. Flour = *Ventilation*
2. Sugar = *PEEP + RM*
3. Butter = *Compliance*
4. Eggs = *I/E*



1. Flour: Ventilation



Avoid Atelectasis during GA

- Loss of muscle tone, diaphragm moves up
- Reduction in chest diameter
- Gravitational and non-gravitational forces

Reduction in lung volume -> atelectasis

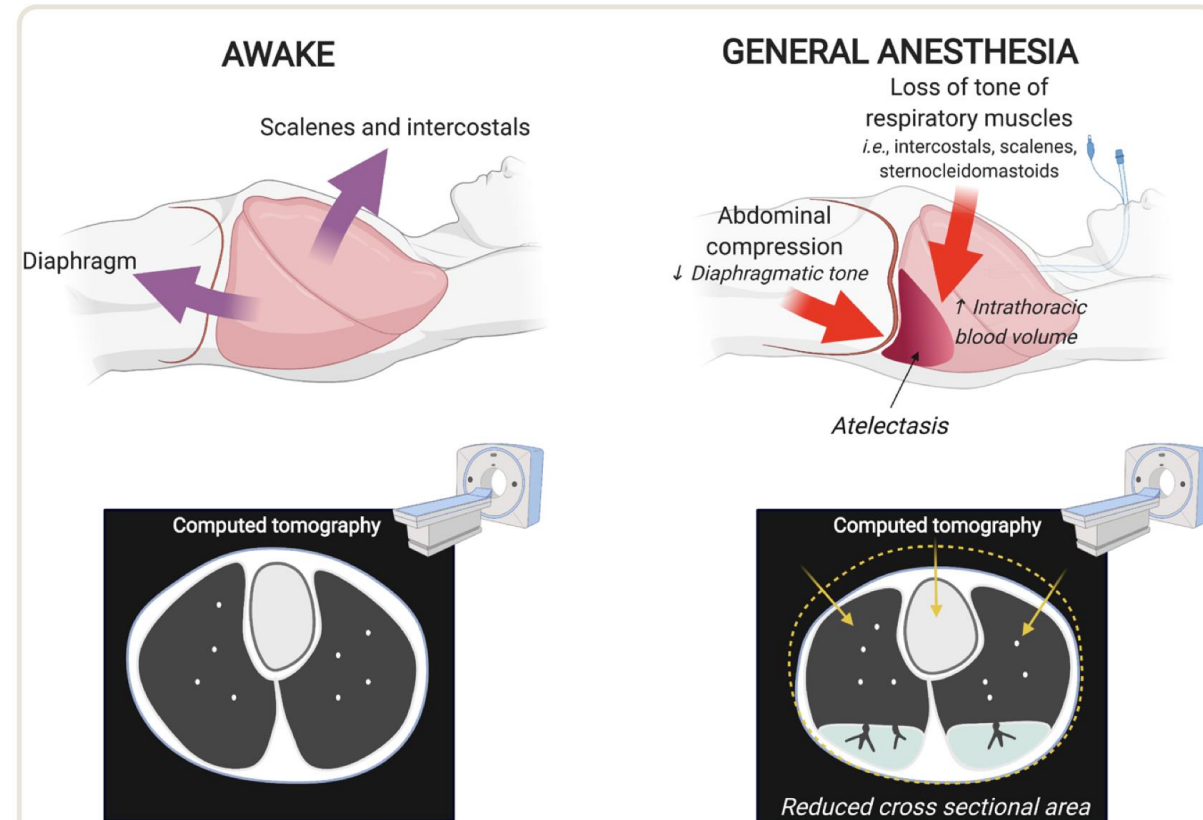
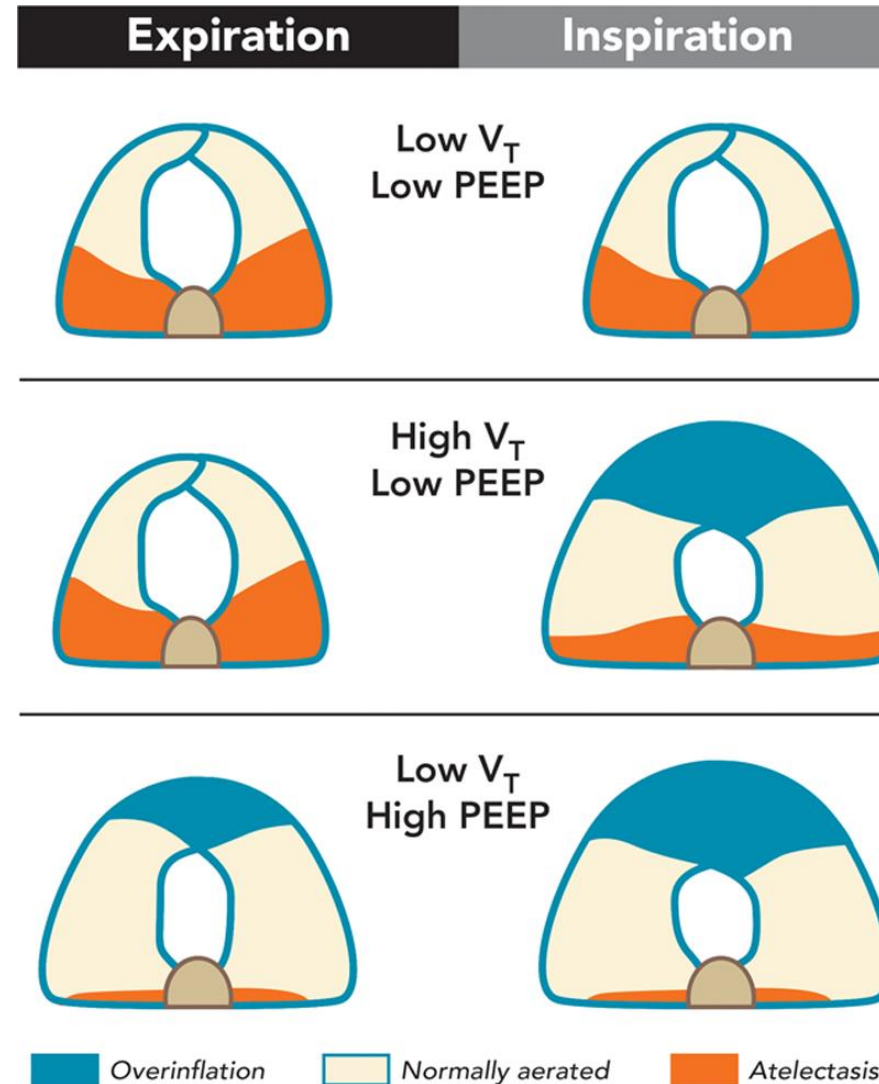


Fig. 3. Changes in chest wall shape due to general anesthesia in a supine patient. During awake spontaneous breathing, contraction of diaphragm and accessory muscles of respiration maintain lung expansion. Loss of muscular tone during anesthesia is associated with cephalad motion of the dependent diaphragm, reduction in cross-sectional chest area, and generation of nongravitational compressive forces (*i.e.*, cephalocaudal gradients). Together with gravitational forces and potential increase in intrathoracic blood volume, these factors contribute to reduction of lung volume and lung collapse, particularly on the dorsal and basal lung regions.

Atelectasis: a major post-op complication

- *Blood oxygenation reduction*
- *Lung compliance decrease*
- *Local tissue inflammation*
 - *Immune dysfunction*
- *Alveolar-capillary barrier injury*
- *Lung fluid clearance reduction*
 - *Increased lung injury*

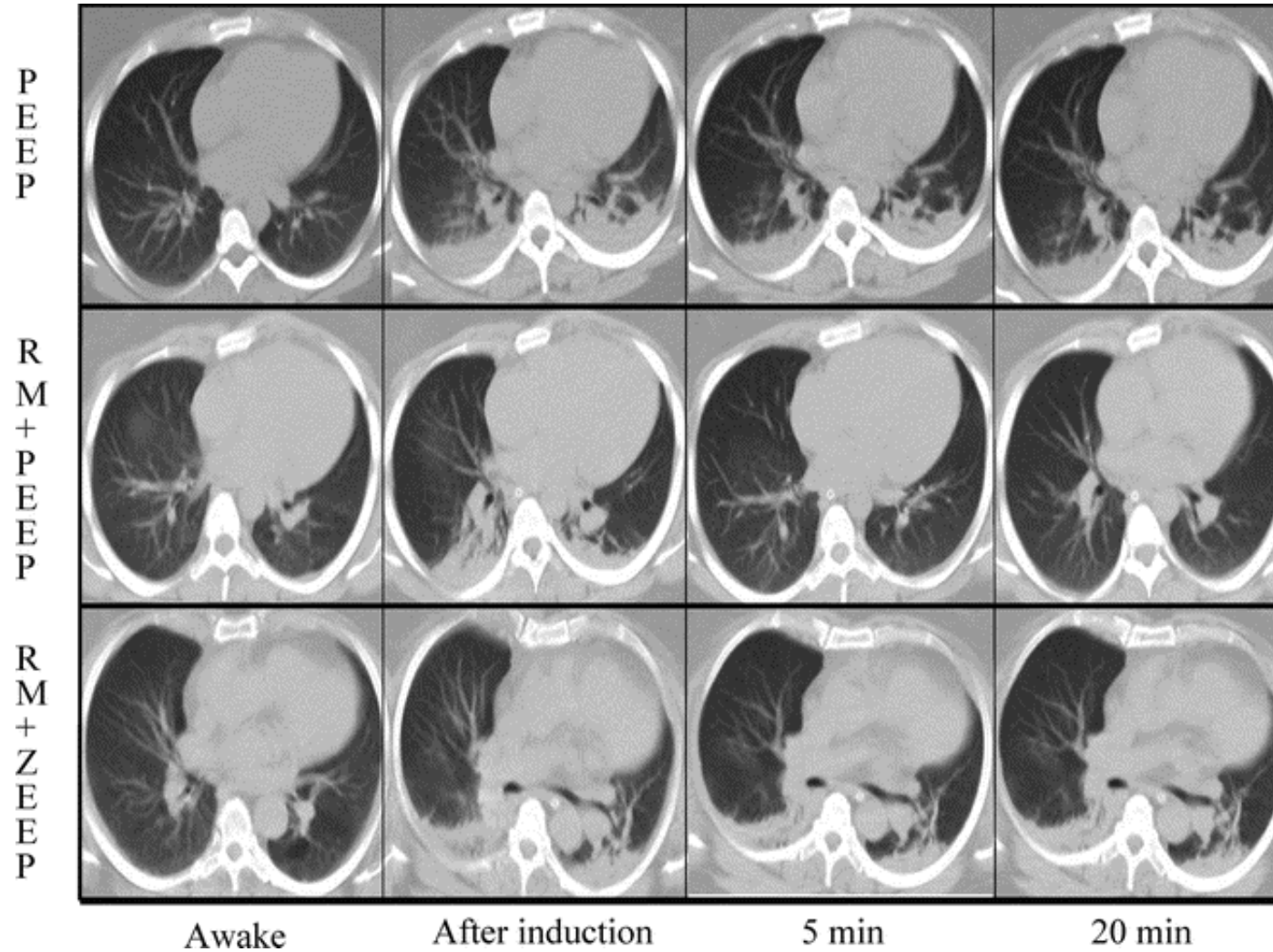
Low TV (6 to 8 mL kg⁻¹ IBW) is most important part of LPV



2. Sugar = PEEP + Recruitment Manoeuvre



Recruitment Manoeuvre



Optimized ventilation strategy for surgery on patients with obesity from the perspective of lung protection: Meta-analysis

- *VCV + PEEPind + RM: optimal for increasing (PaO_2/FiO_2)*
- *VCV + highPEEP + RM : optimal for reducing **postoperative pulmonary atelectasis and inflammation***

quality of evidence was in all cases very low or only moderate.

PROBESE: the end of PEEP and Recruitment?

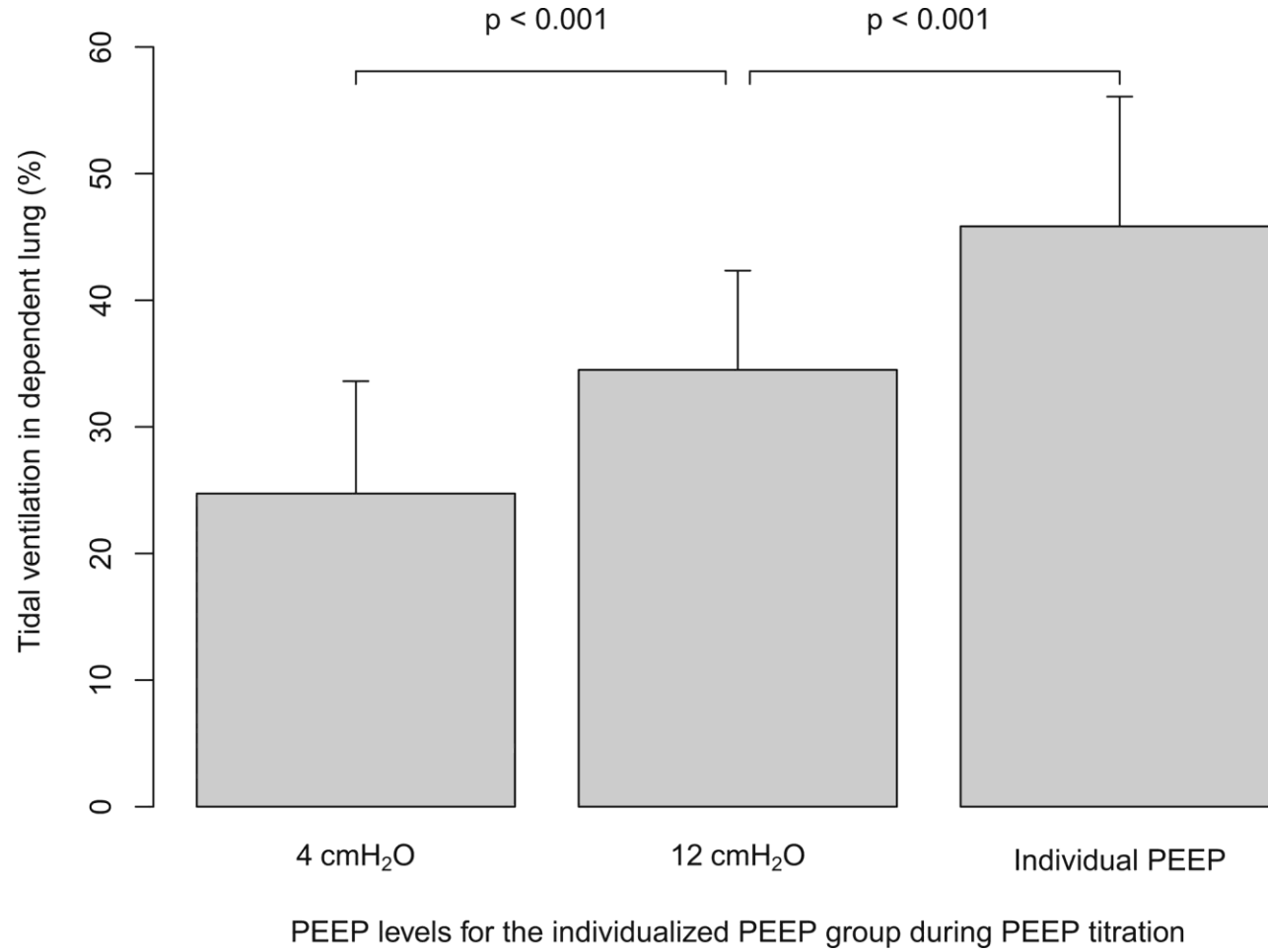
an intraoperative mechanical ventilation strategy with a higher level of 12 cmH₂O PEEP and alveolar recruitment maneuvers

compared with

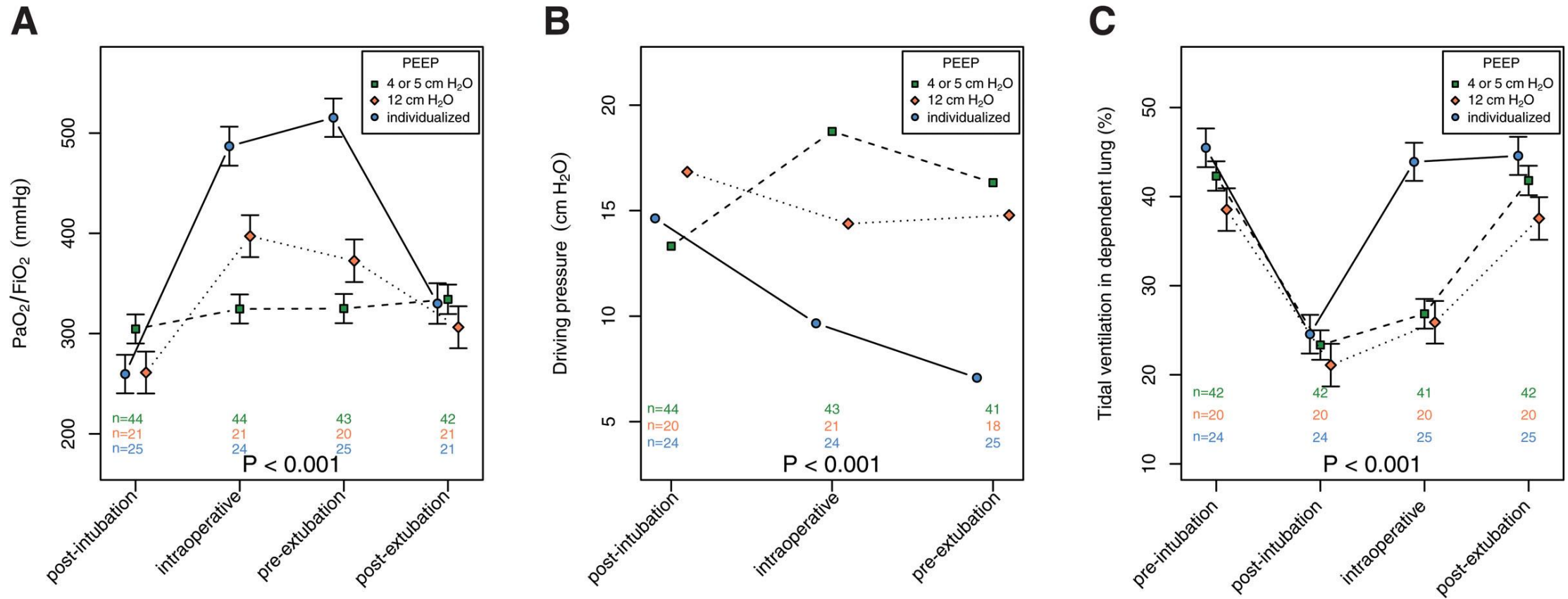
a strategy with a lower level of PEEP

- **did not reduce postoperative pulmonary complications!**
- **More hypotension and pleural effusion in the high PEEP levels**

Ideal PEEP



Ideal PEEP: Individualised PEEP reduces driving pressure and improves P/F



Individualized PEEP in obese (laparoscopy)

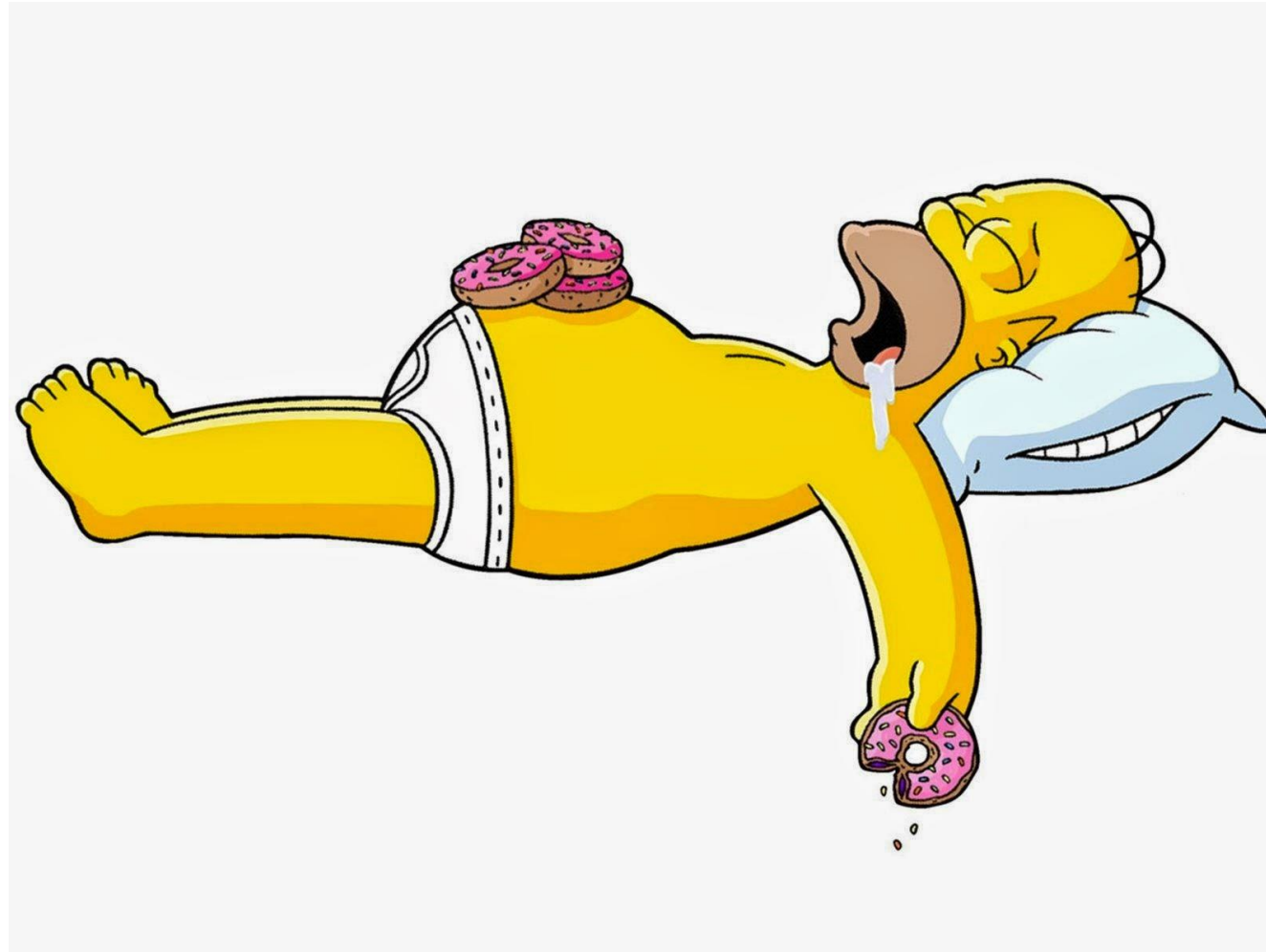
- Mean PEEP 18.5 (5.6) cm H₂O! to keep lung open
- Oxygenation, end expiratory lung volume, distribution of ventilation **BETTER** in the PEEP individual
- Driving pressure **LOWER** (6,7 cmH₂O) in PEEP individual
 - **More vasopressor and fluids needed**

- After extubation: differences between the arms vanished.
- Lung protections should include the postoperative period ?

3. Butter = Compliance



3. Butter = Compliance

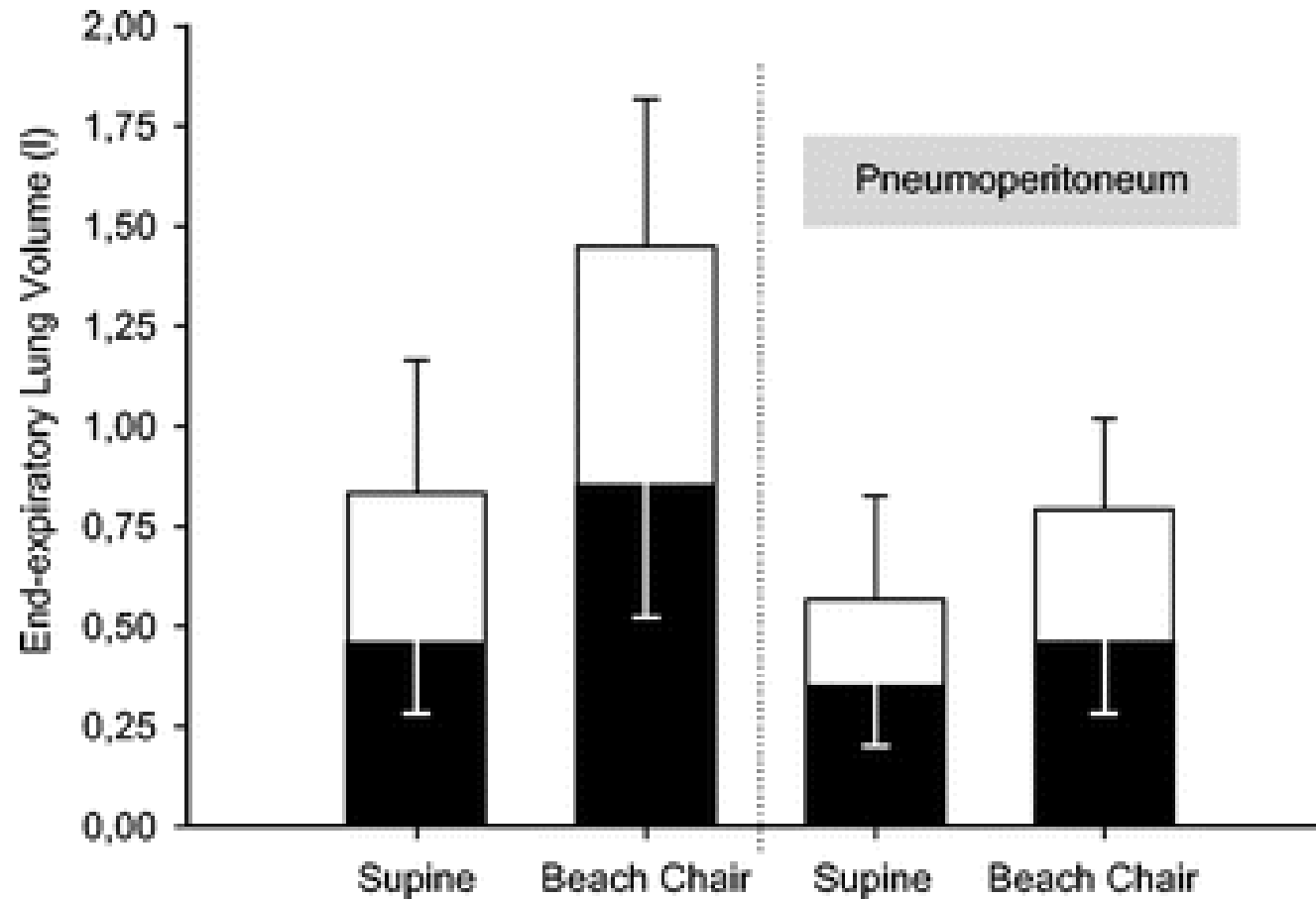


3. Butter = Compliance



Beach Chair Position 30°/30°

Beach Chair Position 30°/30°

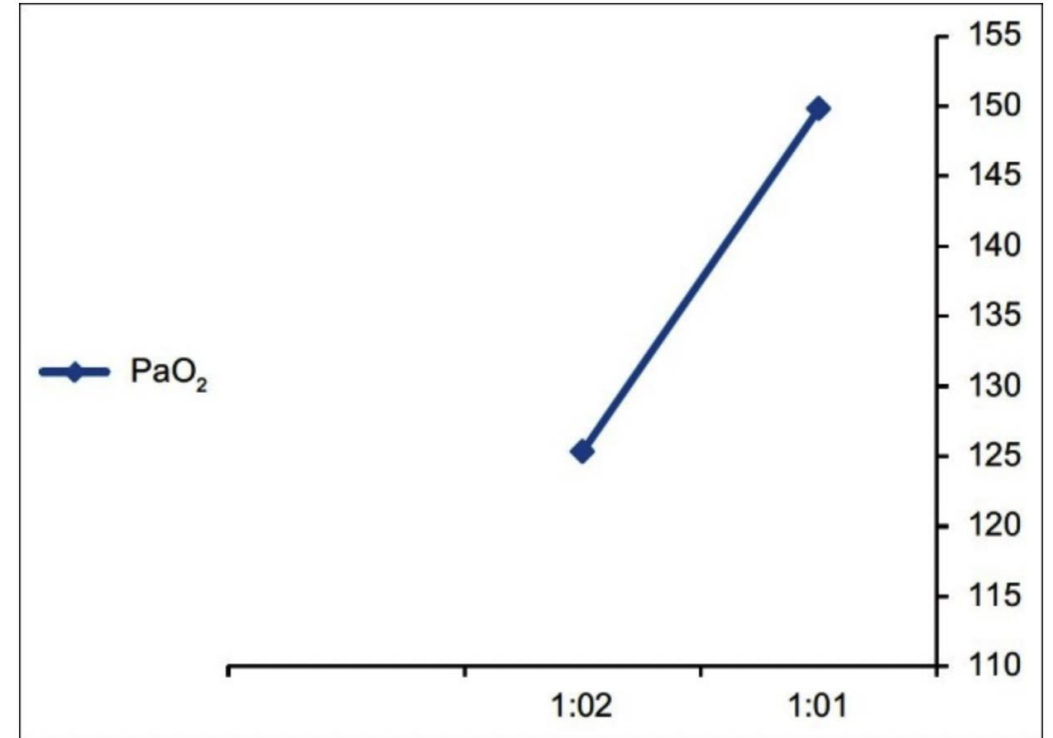
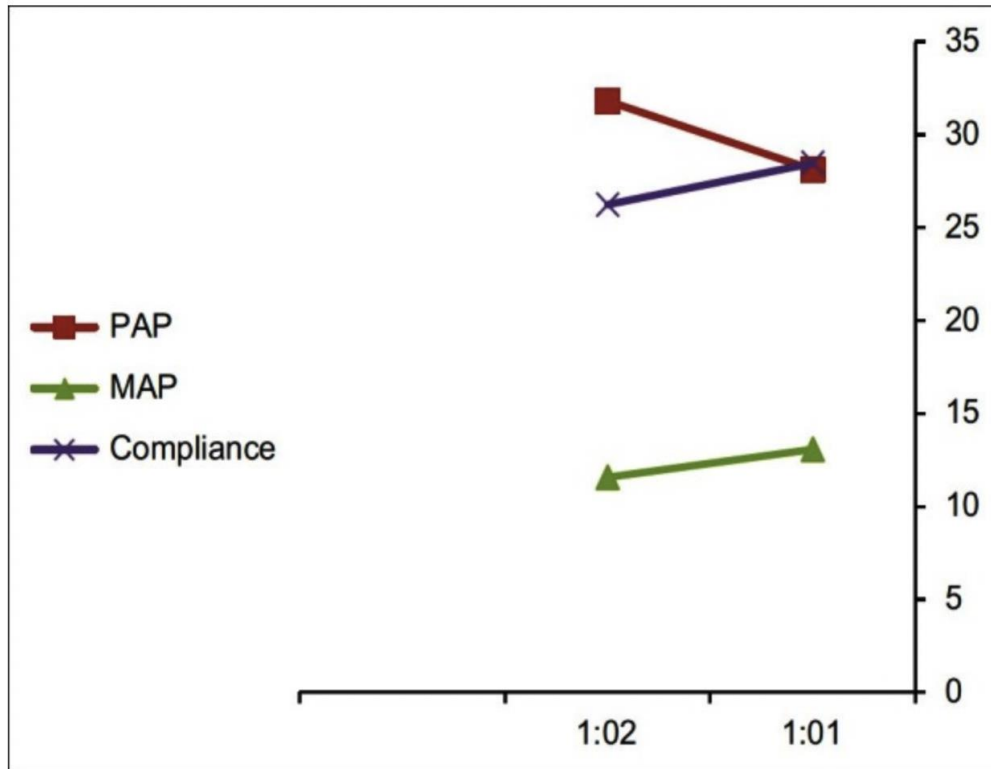


The effects of the beach chair position and positive end-expiratory pressure (PEEP) on end-expiratory lung volumes. Black columns represent values at zero end-expiratory pressure; white columns represent values at 10 cm H₂O PEEP.

4. Eggs= I/E



I/E ratio from 1/2 to 1/1 or even INDIVIDUALISED?



**Individualize I:E
by monitoring oxygenation, C_{RS} , driving pressure**

Conclusion

1. Flour: Ventilation Strategy: Low tidal Volume
2. Sugar: Oxygen delivery strategies: Individualized PEEP + RM
3. Butter: Compliance: Beach Chair Position 30°/30°
4. Eggs: I/E: 1/1 or ind



There is a need for large RCT
with a long-term post-
operative follow-up