

Impact of lung allograft position on lung quality during ex vivo lung perfusion

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Introduction & Aim

- **Lung transplantation** is the ultimate treatment for patients suffering from end-stage pulmonary disease.
- Ex vivo lung perfusion (**EVLP**)^{1,2} is developed to assess, preserve and evaluate donor organs prior to transplantation.
- Potential hazard: **positioning of the graft** in the organ chamber might have a serious impact on the **distribution of perfusion** throughout the lung.

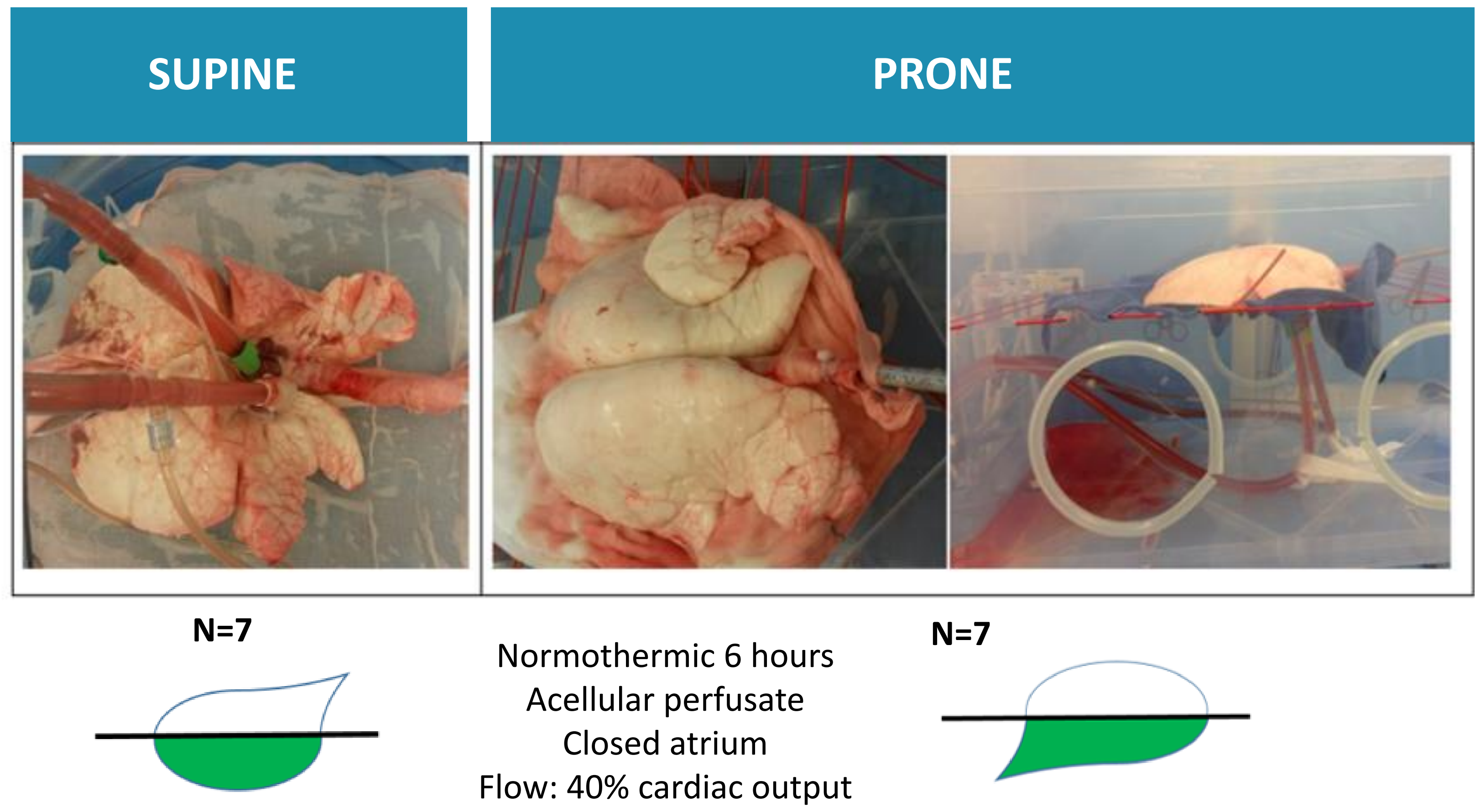
AIM: Optimize EVLP technology by adapting graft positioning during EVLP.

Methods

Standard procurement of porcine lungs (n=7/group) – mean cold ischemic time ± 110 min

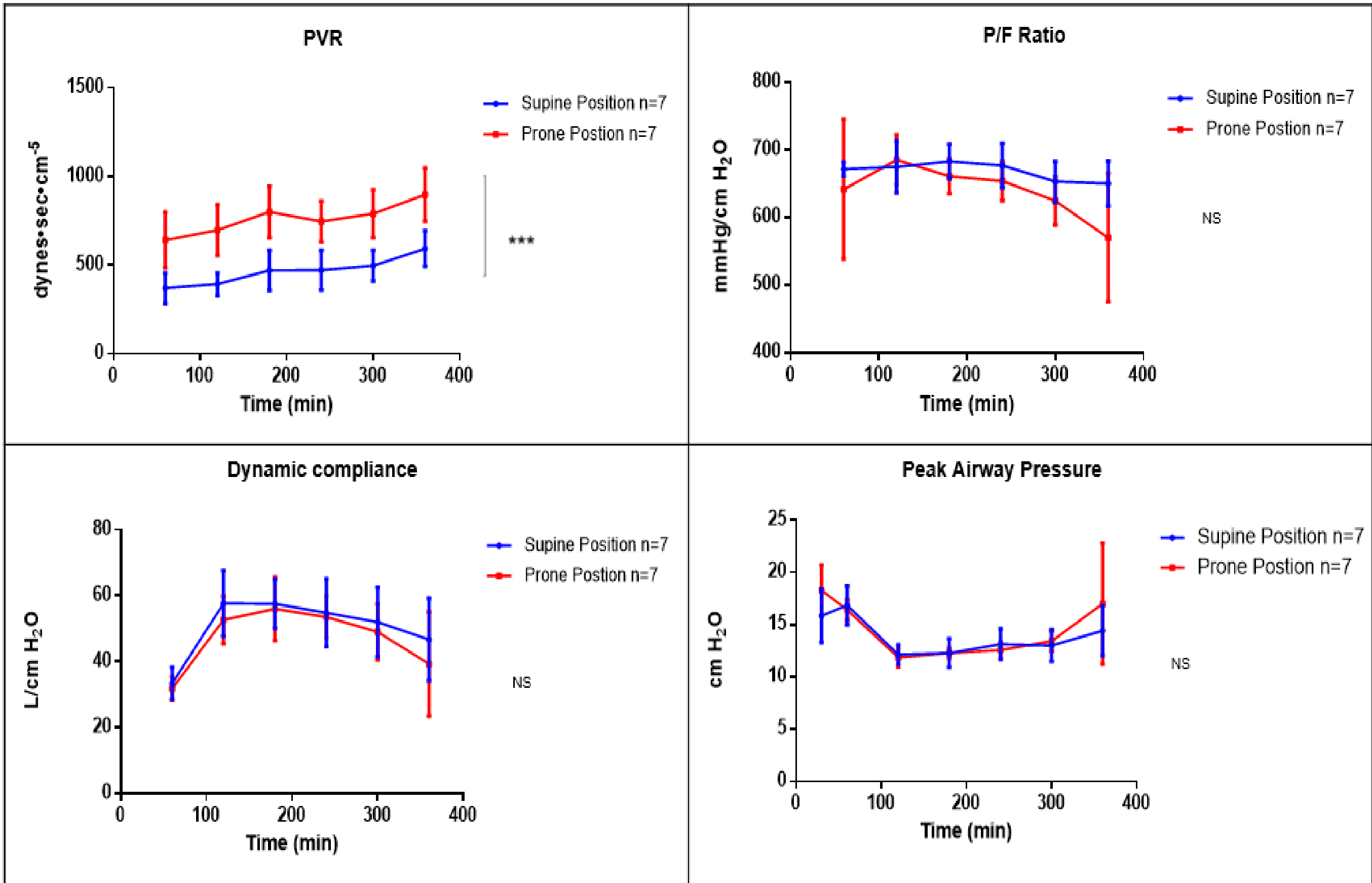
Group 1: EVLP in conventional, supine position
Group 2: EVLP in experimental, prone position

- Parameters:**
- **Wet to dry ratio**
 - **Pathology**
 - **Ex vivo CT imaging** / Frozen in liquid nitrogen vapours / Inflated at 25 cm H₂O



Results

1. EVLP physiology



- Pulmonary vascular resistance (**PVR**) was **higher** in prone position (*upper, left*).
- **No differences** in **P/F ratio**, **dynamic compliance**, **peak airway pressure** between prone and supine

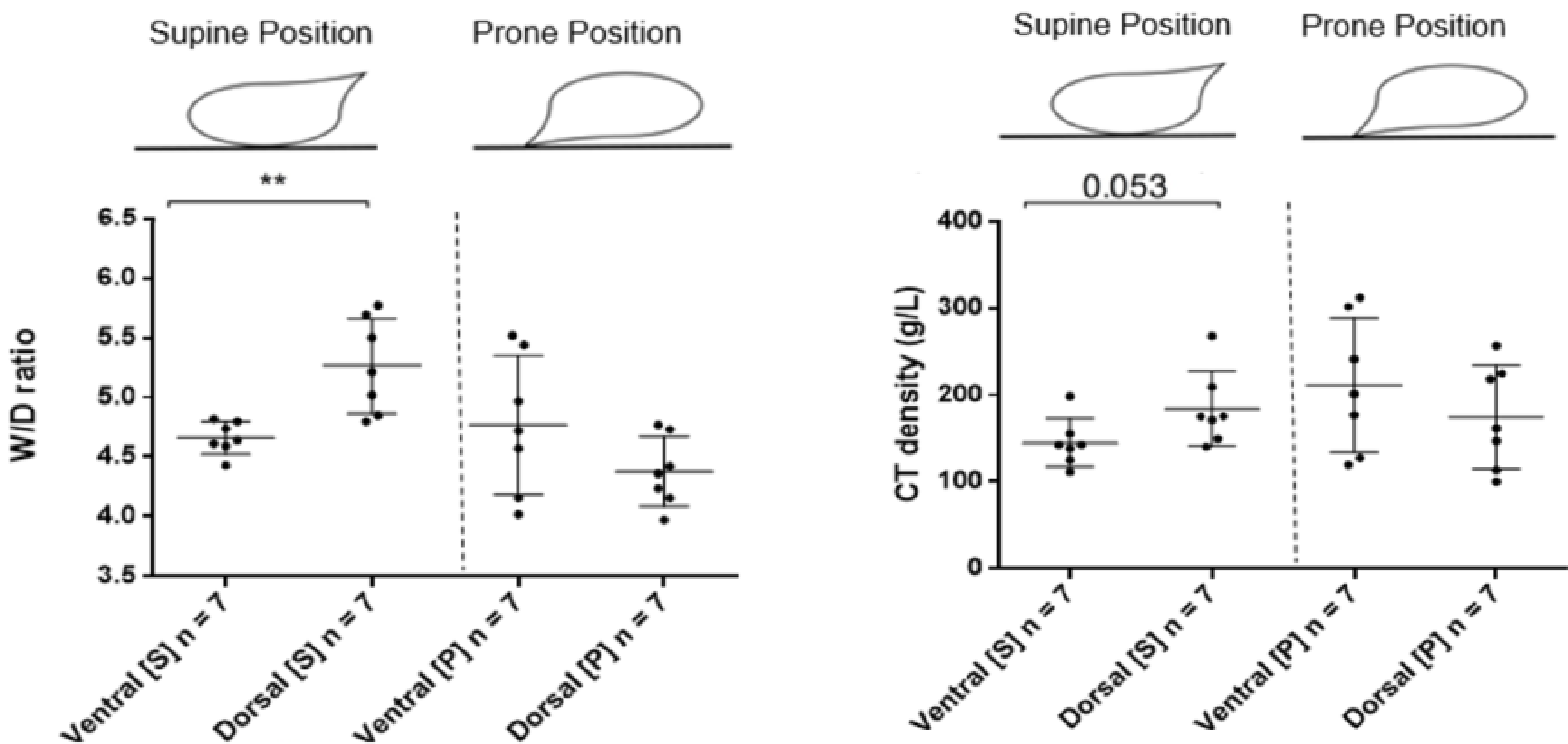
References

¹ Van Raemdonck D, Neyrinck A, Cypel M, Keshavjee S. Ex-vivo lung perfusion. Transpl Int. 2015;28(6):643–56
² Schraufnagel DP, Steffen RJ, Vargo PR. et al. Devices for ex vivo heart and lung perfusion. Expert Rev Med Devices 2018 Mar;15(3):183-191

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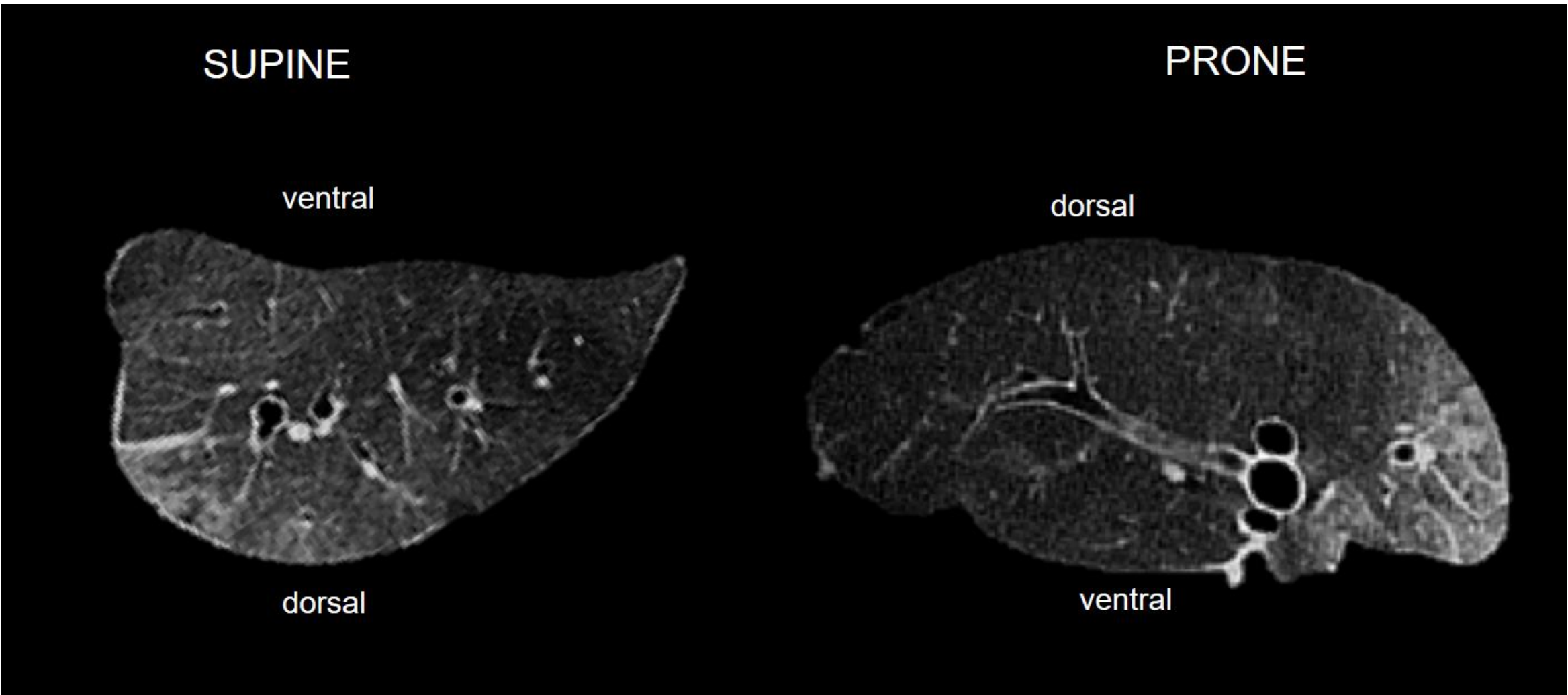
Results

2. W/D ratios and CT density measurements after EVLP



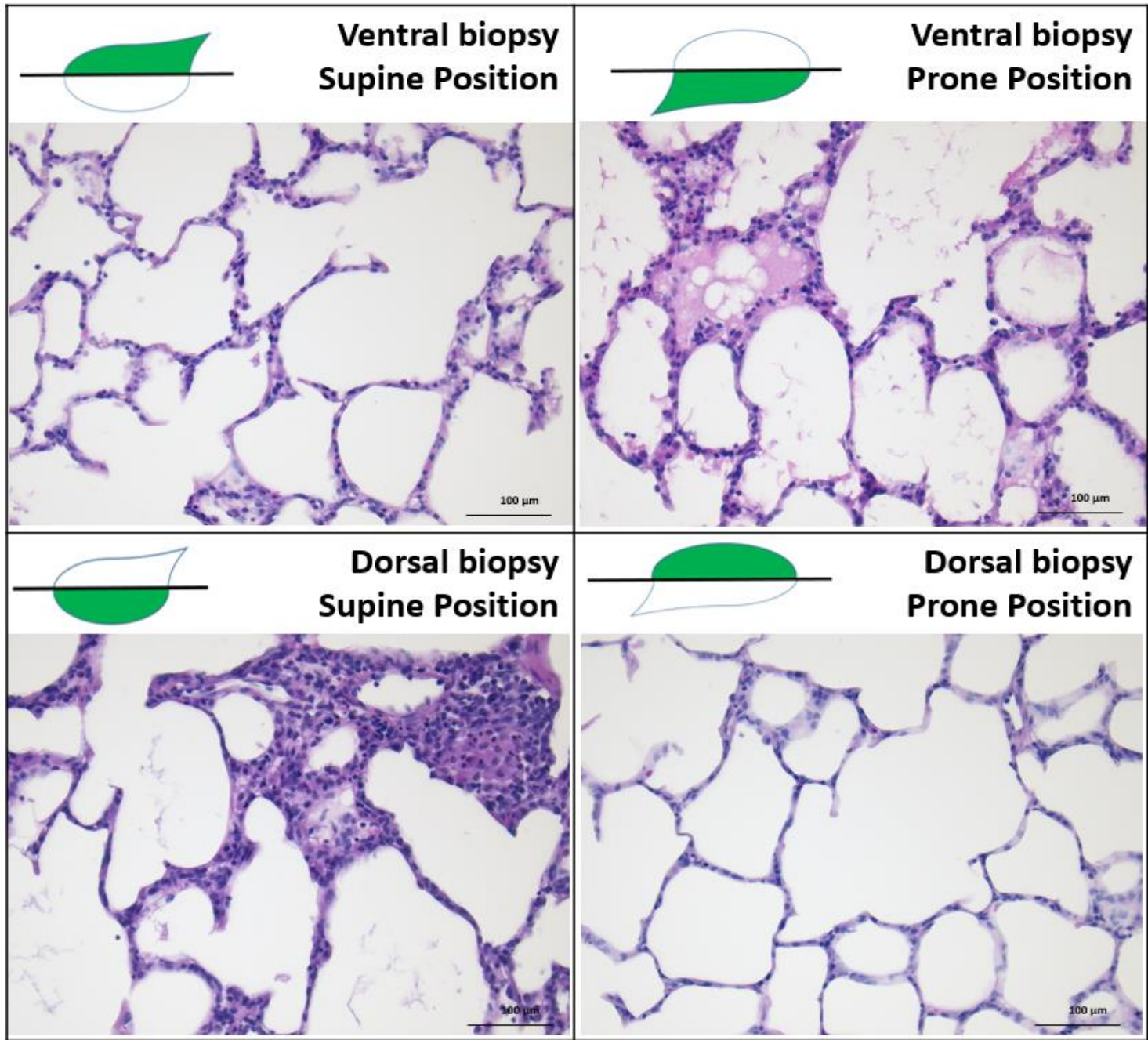
- **Supine group:** higher W/D ratio in dorsal biopsy compared with ventral biopsy
- **Prone group:** no difference in W/D ratio between dorsal and ventral biopsy
- **CT density measurements** revealed no difference between ventral and dorsal biopsies in both groups.

CT imaging post EVLP



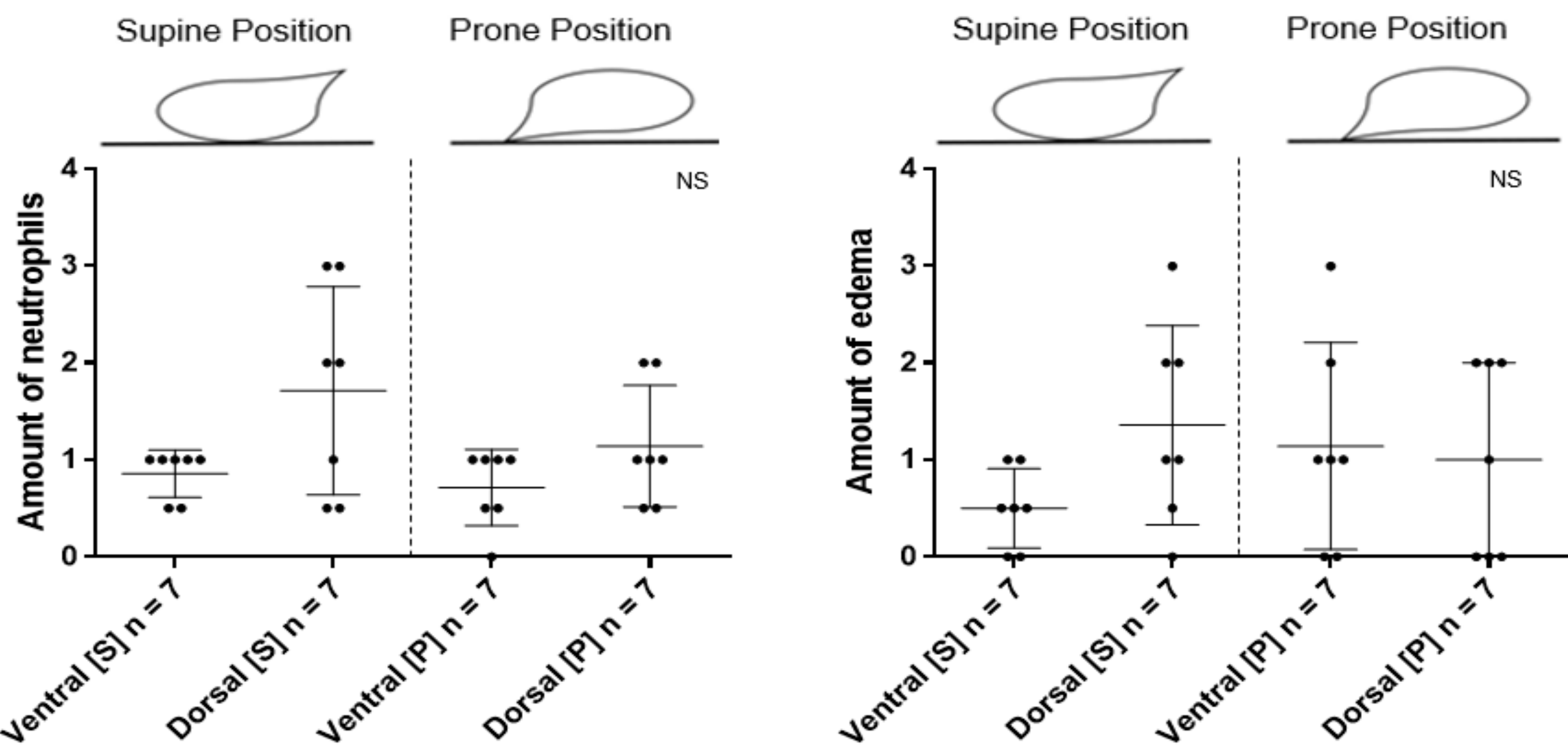
Ex vivo CT imaging of the right graft after EVLP reveals more edema in the lower regions (ventral in prone position and dorsal in supine position).

3. Pathology after EVLP



More edema and inflammation present in H&E staining of **lower lung areas** (ventral biopsy prone position and dorsal biopsy supine position) (*left*).

Quantification of pathology showed **no difference** in amount of neutrophils and amount of **edema** between the supine and prone group (*down*).



Conclusion

- **Positioning** of the lung (supine versus prone) during EVLP **impacts** physiological assessment and **regional accumulation** of lung edema.
- There is a **more homogenous edema distribution** in the prone positioned group.
- If injury can be reduced and EVLP time be prolonged by these interventions **new possibilities will occur to preserve the graft during a longer interval and potentially increase active resuscitation strategies.**