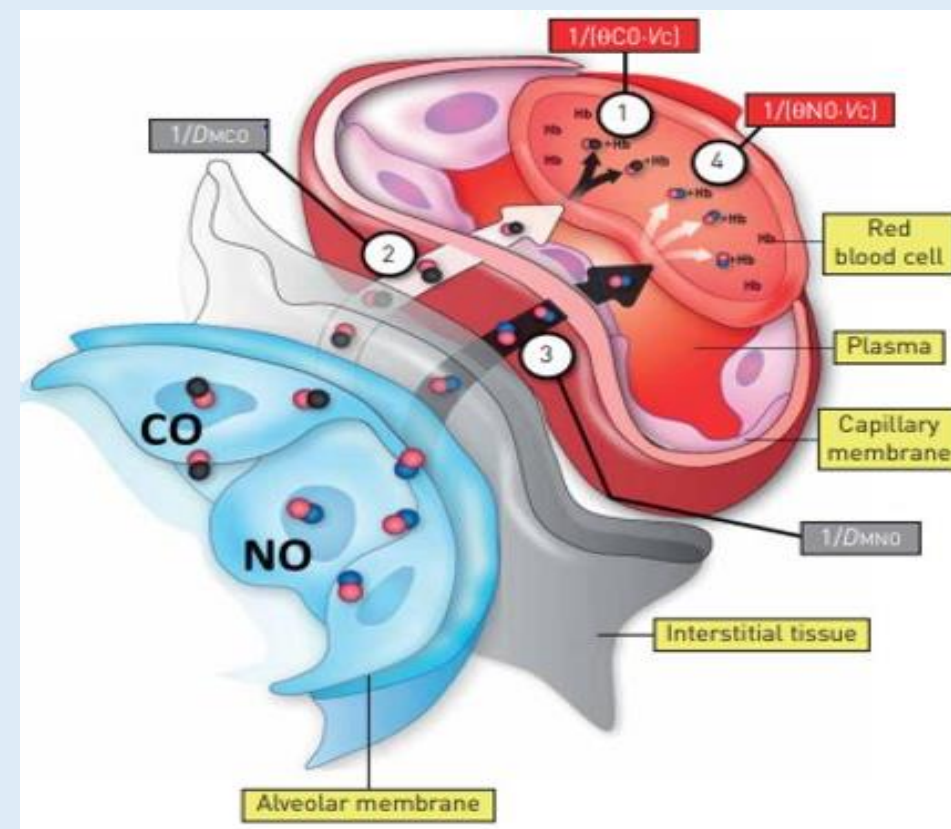


Background

- DLNO/CO is able to dissociate the membrane component (Dm) and the capillary volume (Vc) participating in gas exchange.¹
- Diffusion capacity of a gas across the alveolo-capillary membrane (Roughton-Forster Equation).²

$$\frac{1}{DLCO} = \frac{1}{Dm_{CO}} + \frac{1}{\theta_{CO} \cdot V_C}$$

$$\frac{1}{DLNO} = \frac{1}{Dm_{NO}} + \frac{1}{\theta_{NO} \cdot V_C}$$



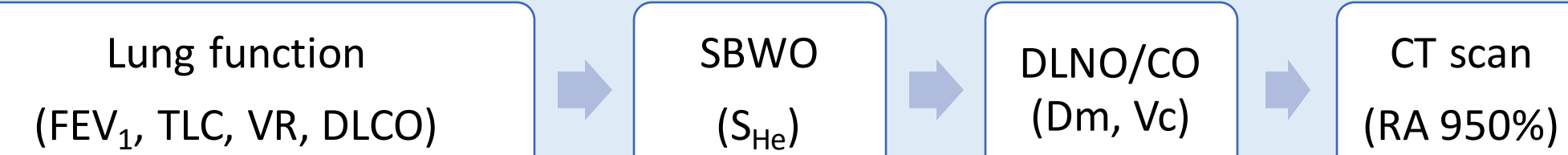
Aim of the study

- Evaluate the interest of double diffusion in patients with COPD.
 - Assess Dm and Vc.
 - Correlate Dm and Vc with markers of proximal and peripheral ventilation as well as tissue oxygenation.

Methods

- 31 patients with COPD recruited from HUB (Erasme), who presented once to the laboratory with a previous medication washout (SABA 6-8h; LABA ≥ 48h; LAMA ≥ 5 days).

Measurements



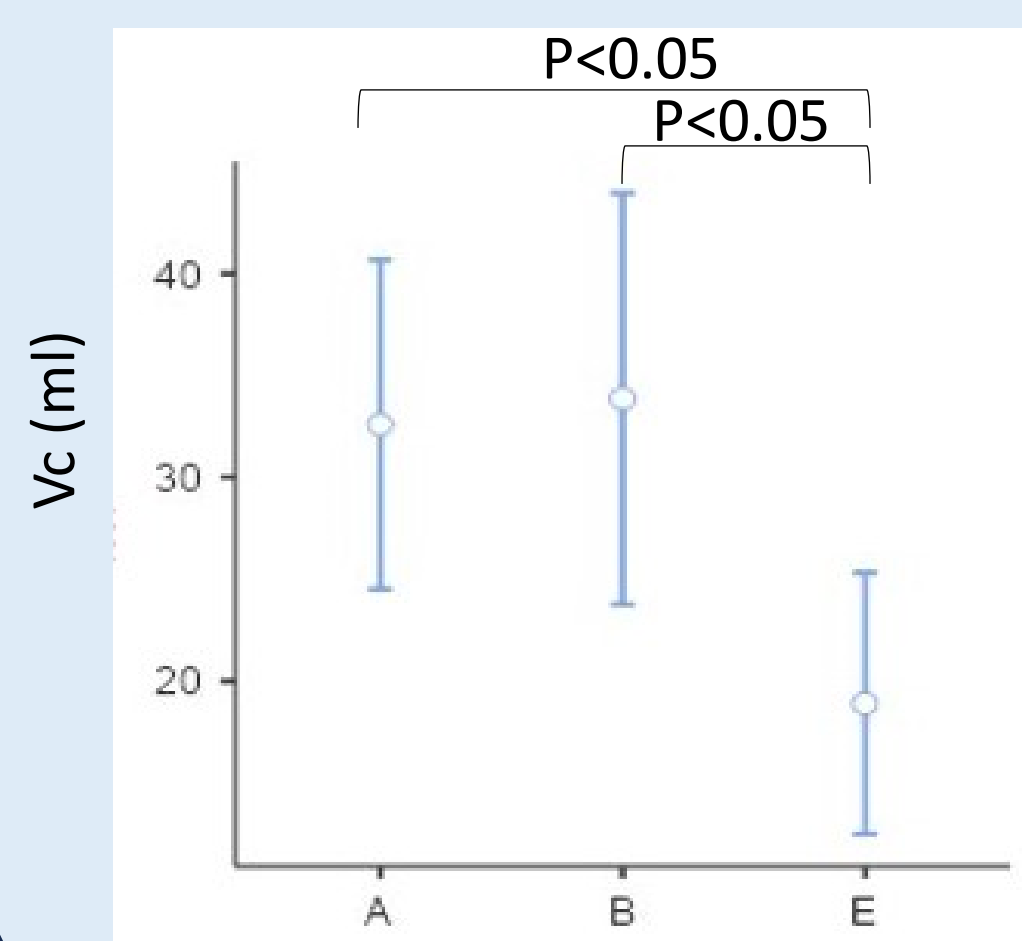
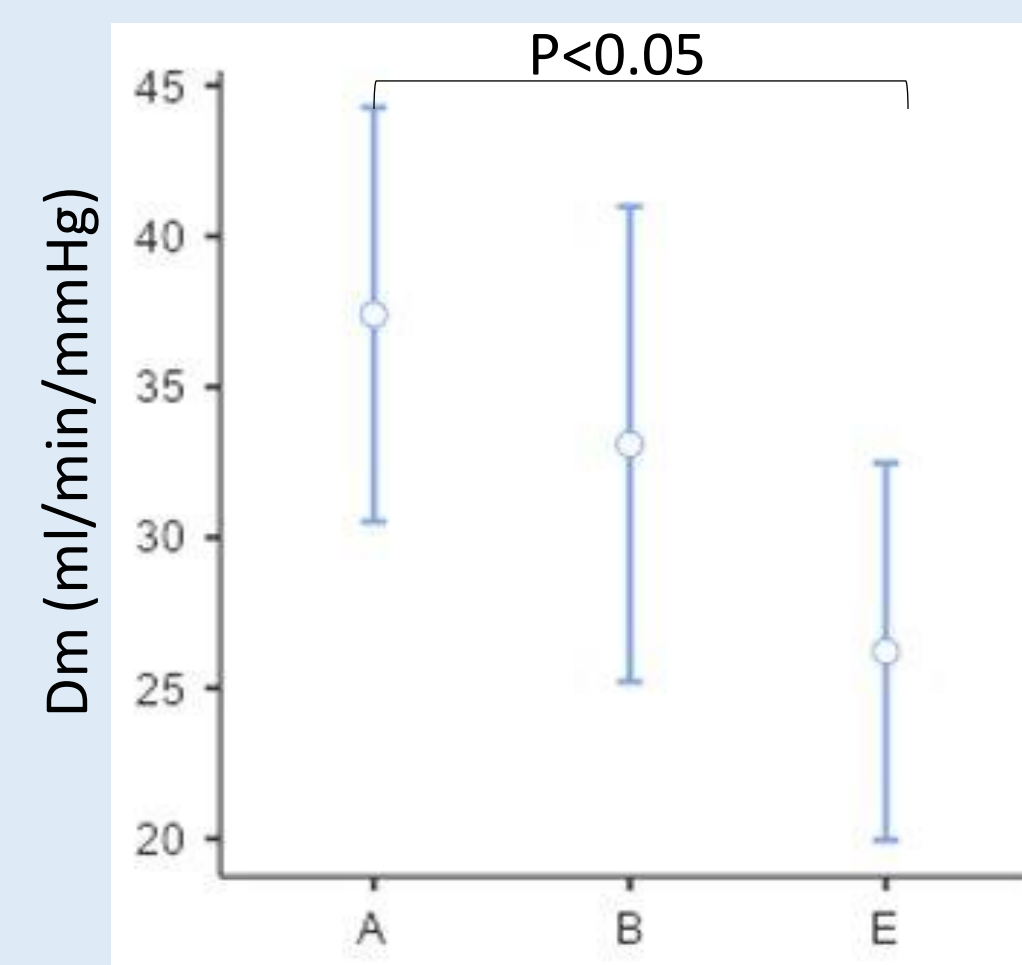
Continuous Transcutaneous oximetry (TcO₂)

- lung function : Measure of FEV₁, CPT, VR and DLCO.
- SBWO : Assessment of peripheral ventilatory heterogeneity.
- DLNO/CO : Single breath test, estimation of the capillary volume (Vc) and the membrane component (Dm).
- CT scan : Quantify the extent of emphysema.
- TcO₂ : non-invasive and reliable estimation of tissue oxygenation (forearm measure).

Population Characteristics (N=31)

Age (year)	65 ± 9
Sex (%F)	61
Active smoker (%)	35
GOLD A/B/E ³	26/50/26
COPD Assessment test	12 ± 8
FEV ₁ (%pred)	50 ± 17
FEV ₁ /FVC (%)	52 ± 10
DLCO (%pred)	52 ± 16
LABA (%)	90
LAMA (%)	94
ICS (%)	35
Dose (µgBDPeq.day ⁻¹)	680 [500-800]

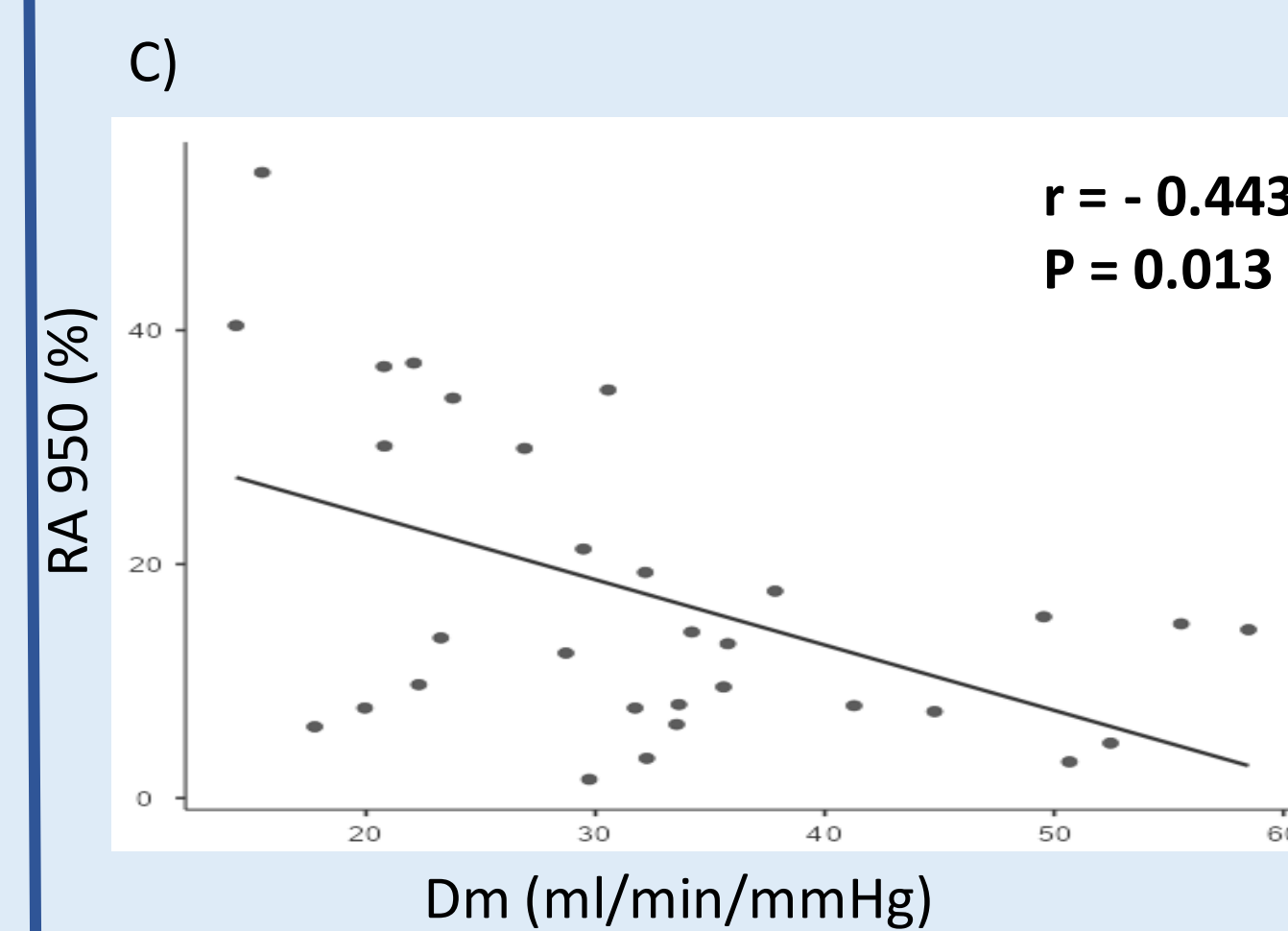
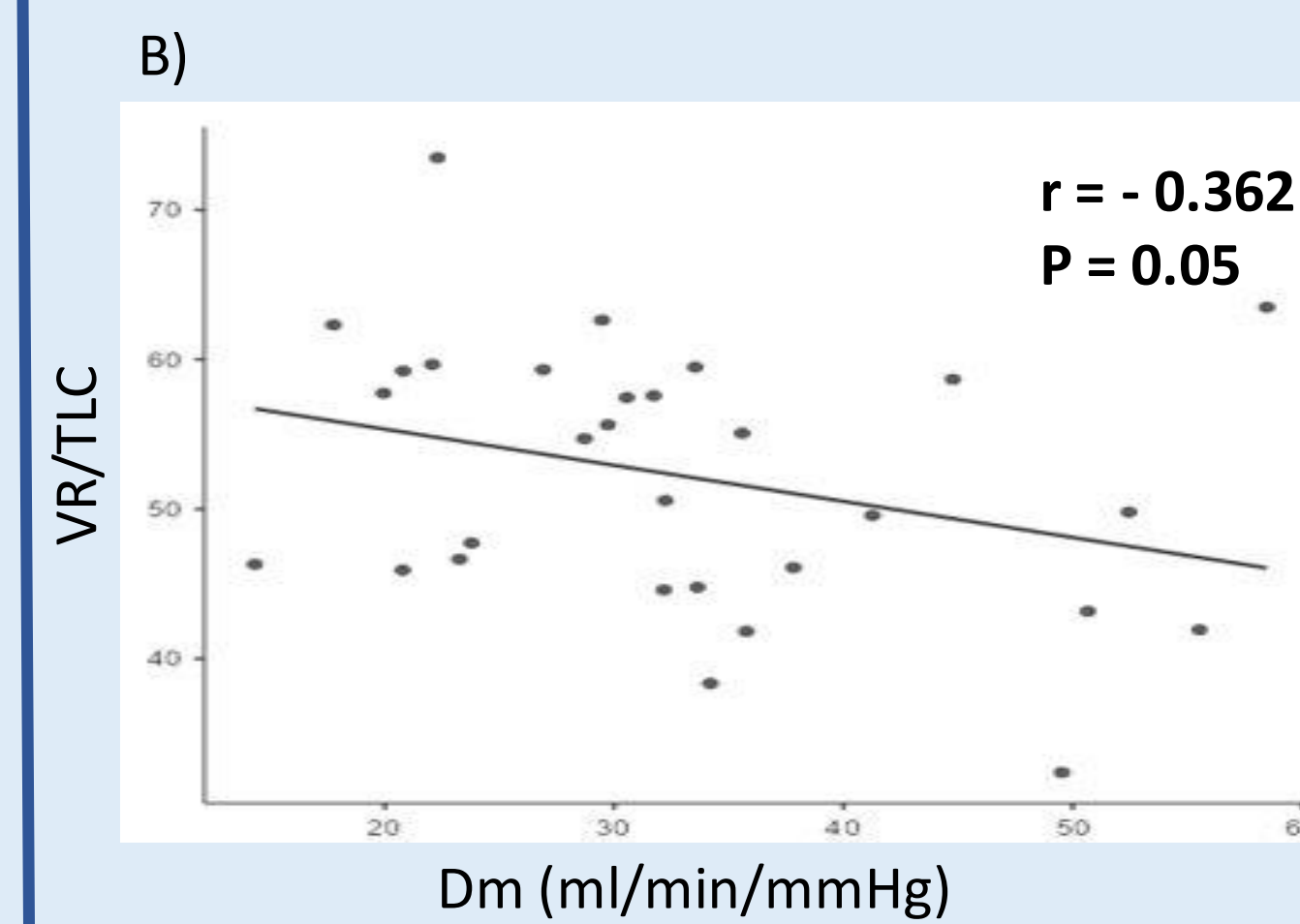
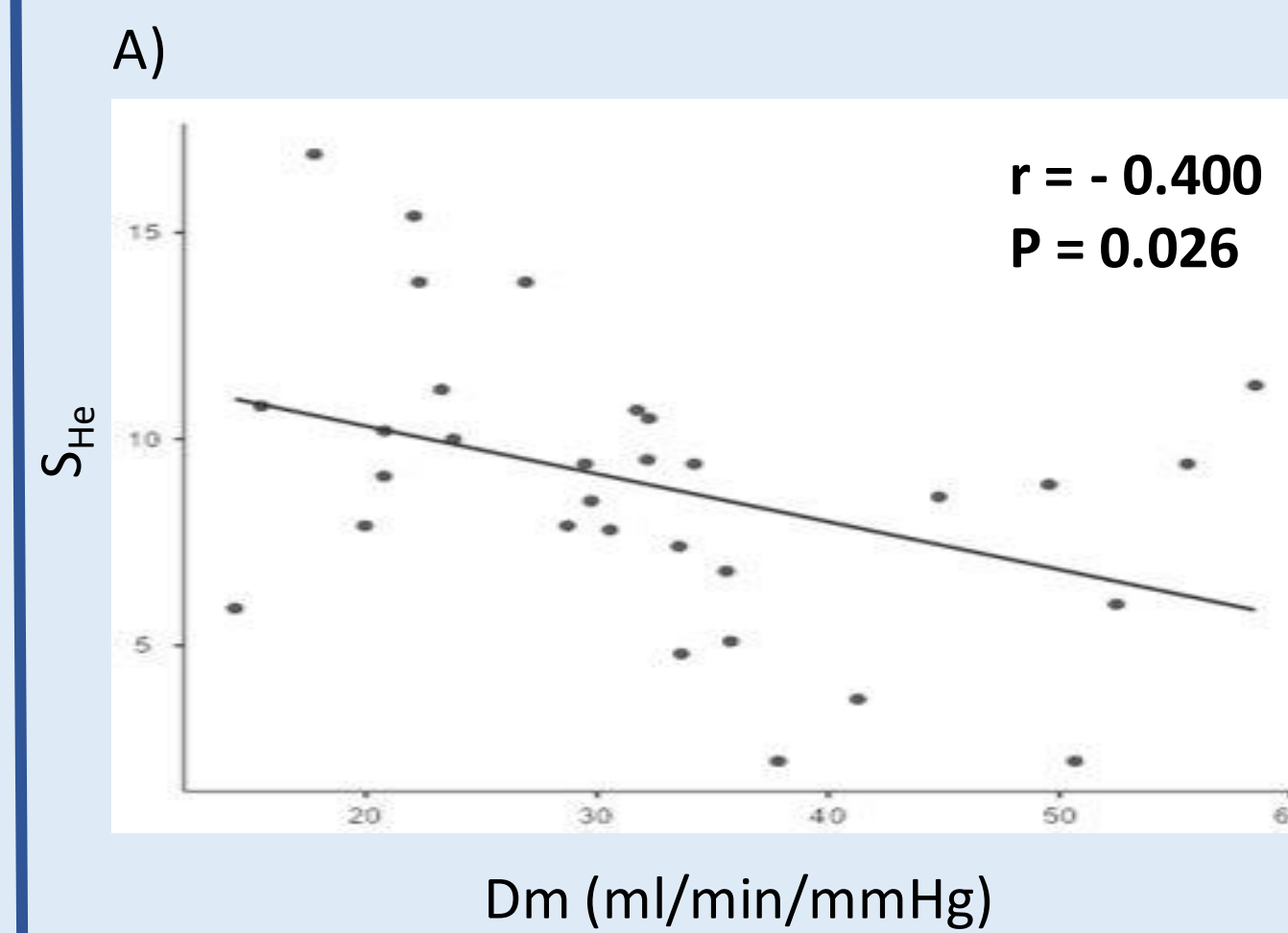
Dm and Vc according to GOLD groups



Results

Correlations between Dm and :

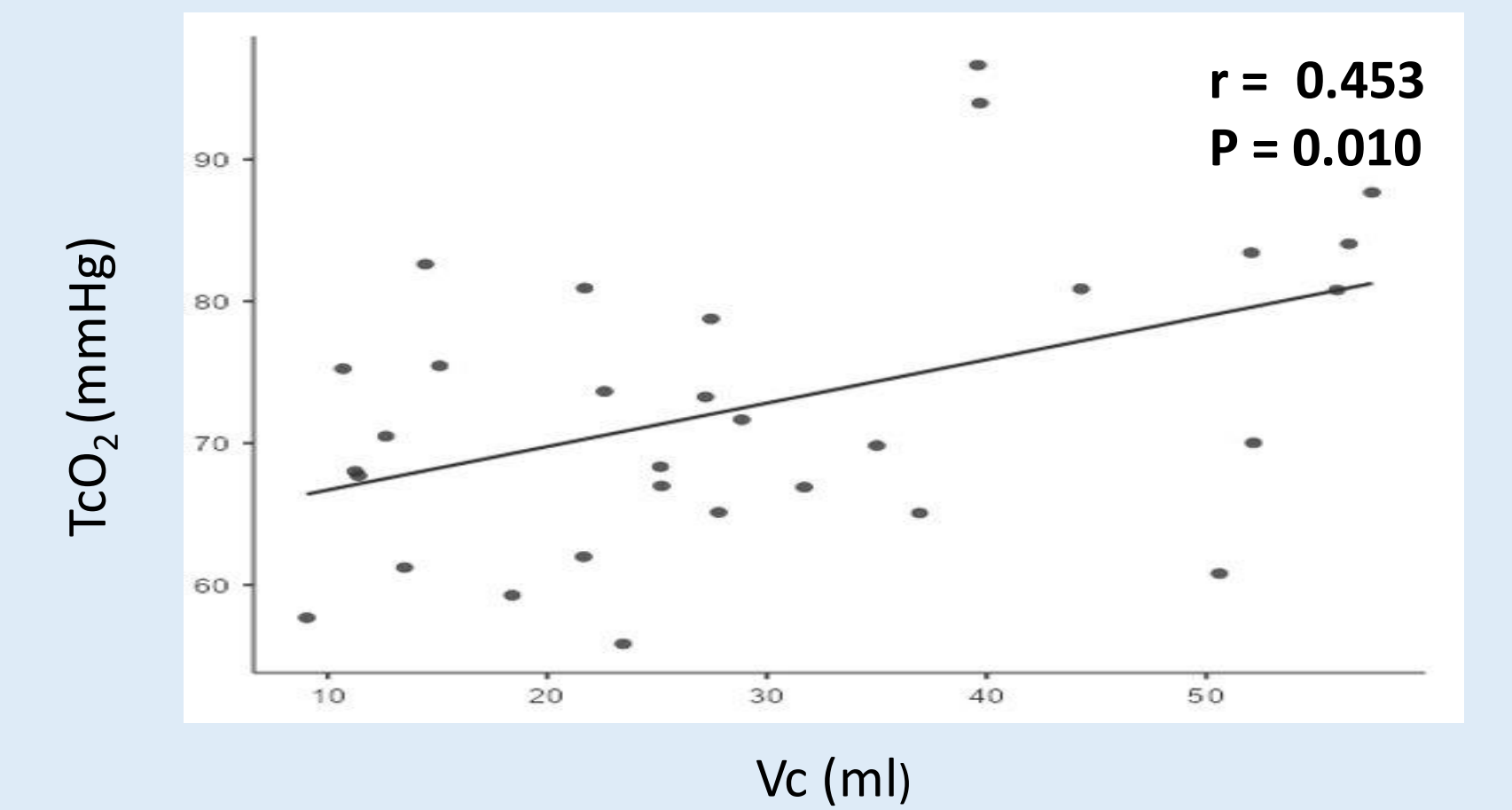
- Peripheral ventilatory heterogeneity
- Index of hyperinflation
- Extent of emphysema



These correlations suggest that COPD patients with higher Dm also have less ventilatory heterogeneity, hyperinflation and emphysema.

Results

Correlations between Vc and tissue oxygenation



These graph means that COPD patients with reduced capillary volume experience lower tissue oxygenation.

Conclusion

- Alteration of membrane component is associated with peripheral ventilation alteration and the degree of hyperinflation.
- While pulmonary capillary volume is linked to peripheral tissue oxygenation.
- In frequent exacerbators and patients with emphysema, both membrane and capillary components of lung diffusion are reduced.
- DLNO/CO provides additional insights on gas exchange impairment in COPD.⁴

References

- Zavorsky G, et al. ERS Technical Standards, Eur Respir J 2017; 49 : 1600962
- Hughes M. The Roughton-Forster equation for pulmonary diffusion: how it happened. Eur Respir J 2022; 60: 2200789
- Global Strategy for the diagnosis, management and prevention of COPD, 2023 report
- Zavorsky GS, van der Lee I. Respir Physiol Neurobiol. 2017 PMID: 27884796

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