

Evaluation of Cardiac/Pulmonary Measurements from a Novel Non-Invasive Health Monitor Compared to Gold Standard Methods

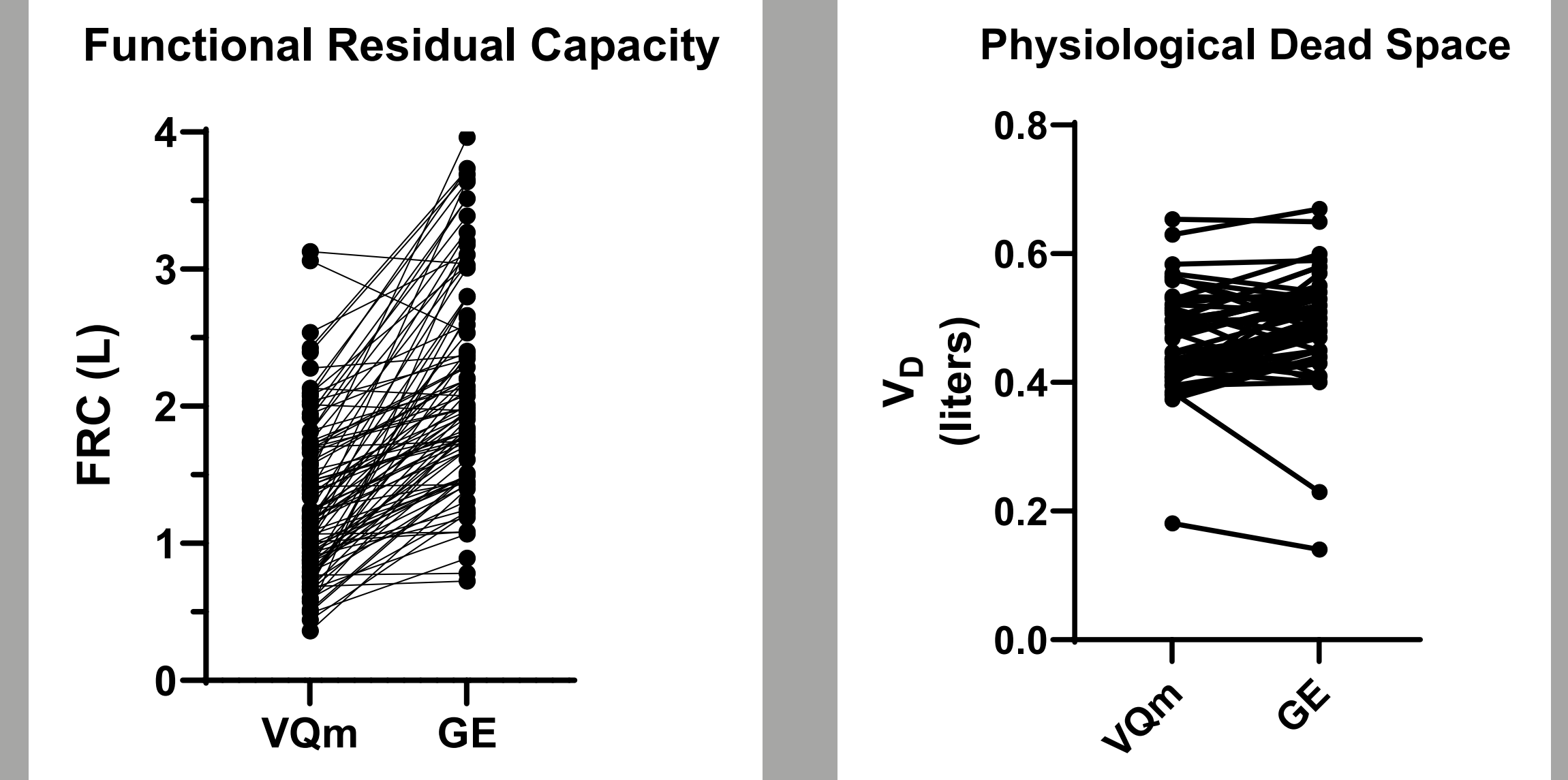
Presenter: Jack Dokhanchi, Mentor: Neal Fleming, M.D., Ph.D., Poster Category: Clinical Science

BACKGROUND

- Functional Residual Capacity (FRC) and Physiological Dead Space (VD) measurements are invasive and time-consuming, yet crucial for understanding ventilation-perfusion matching and guiding patient care.
- Using sequential gas delivery, The VQm Pulmonary Health Monitor (PHM)[™] non-invasively measures FRC and VD.
- A study using the VQm PHM[™] in a porcine model demonstrated comparable results to gold standard methods.¹
- Major Aim: Compare the VQm PHM[™] cardiopulmonary function parameters to current gold standard methods in mechanically ventilated patients.

The VQm PHM[™] health monitor estimates FRC with good trending and Dead Space with good agreement and good trending compared to gold standards.

RESULTS



	VQm FRC	GE FRC	VQm VD	GE VD
Patients	23		19	
# of Measurements	98		89	
Minimum	0.36 L	0.73 L	0.18 L	0.14 L
Median	1.2 L	2 L	0.43 L	0.47 L
Maximum	3.1 L	4 L	0.65 L	0.67 L
Range	2.8 L	3.2 L	0.47 L	0.53 L
Mean	1.3 (0.57) L	2.1 (0.75) L	0.44 (0.08) L	0.45 (0.1) L
Bias	-0.8L		-0.01 L	
95% Limits of Agreement	-2.1 to 0.4 L		-0.13 to 0.1	

METHODS

All study procedures approved by IRB at UC Davis Medical Center, and written, informed consent was obtained from 42 patients scheduled for an elective surgical procedure.

Gold Standard Methods

- FRC: Nitrogen Washout
- VD: volumetric capnography and blood-gas measurements

VQm PHM[™] Methods

- FRC: 3-breath CO₂ ventilatory bolus using sequential gas delivery and a modified differential Fick equation
- VD: estimated by coupling volumetric capnography and arterial blood gas values

Agreement was evaluated with Bland-Altman analysis and concordance was evaluated using a four-quadrant plot analysis.

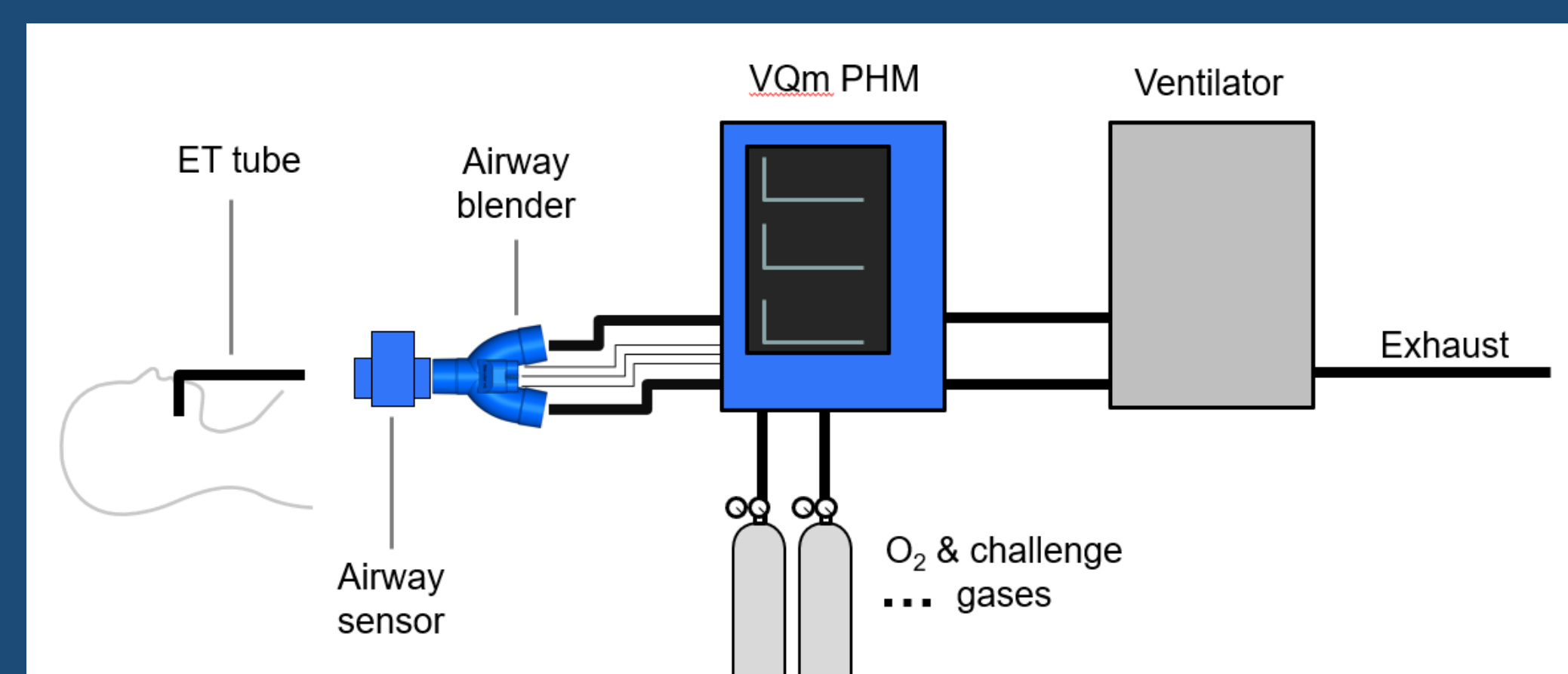


Figure 1: Systematic diagram of where the VQm PHM[™] attaches to the patient's breathing circuit.

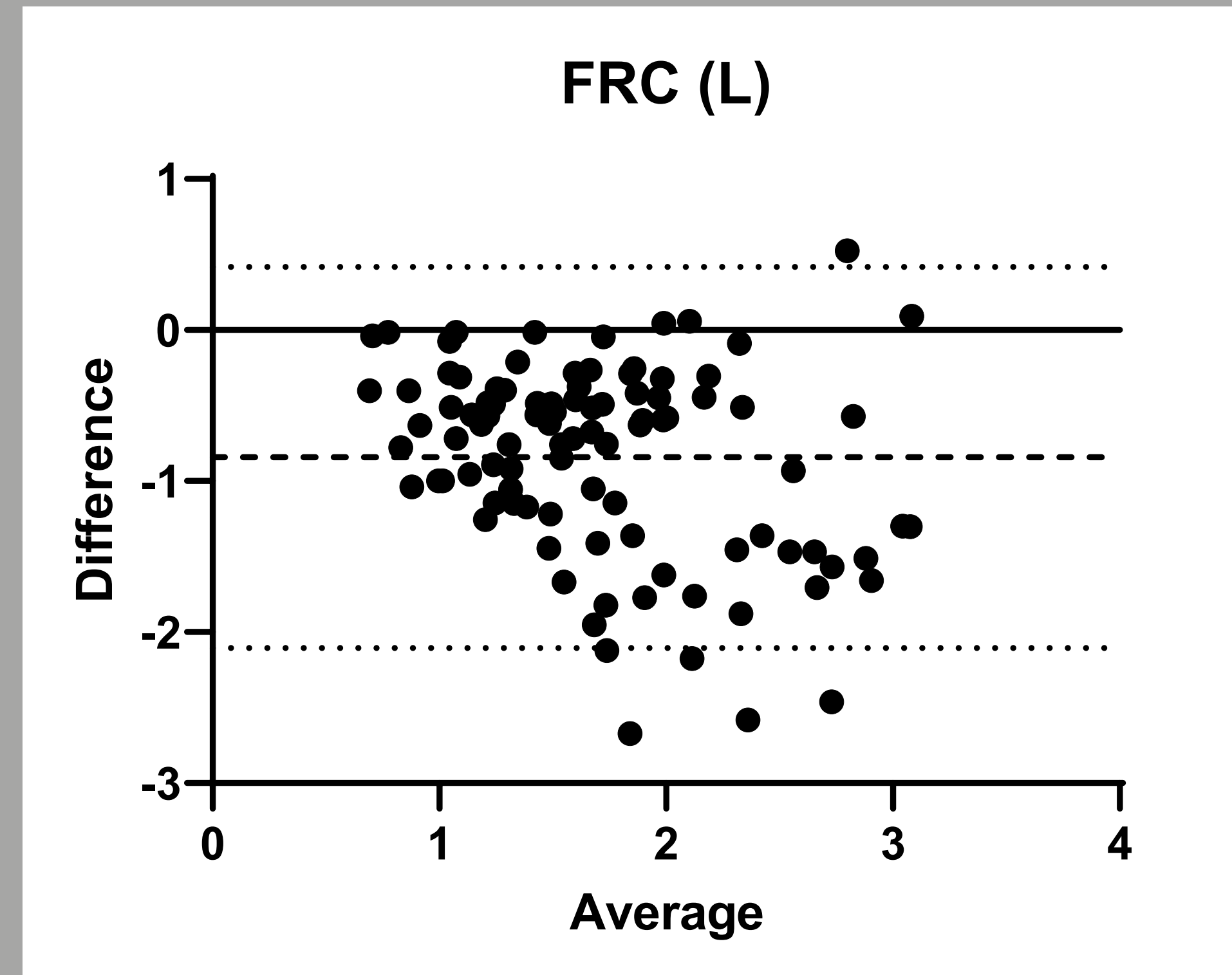


Figure 1: Agreement between our reference FRC and values obtained using VQm PHM[™].

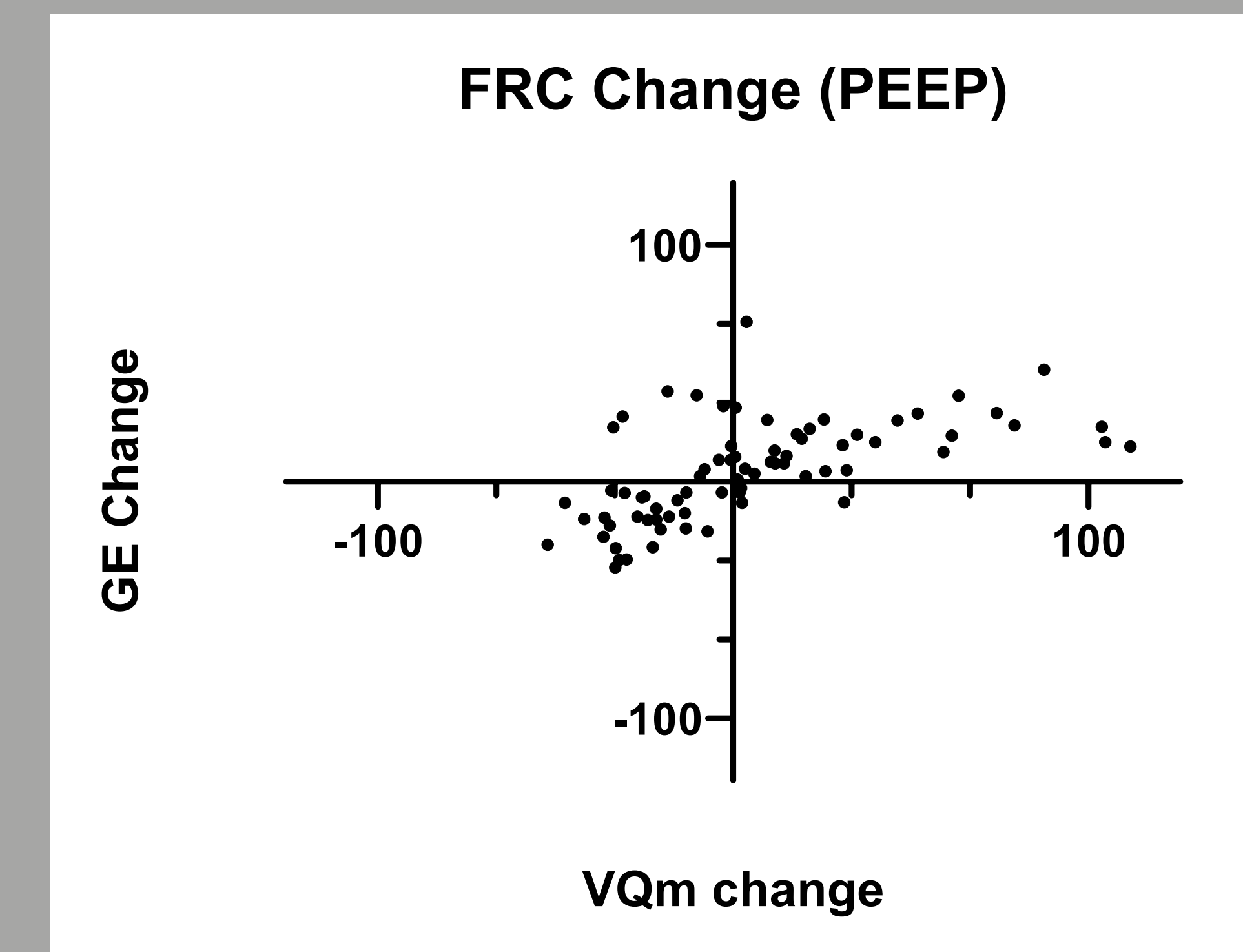


Figure 2: Direction of change between VQm PHM[™] FRC and our reference FRC. Concordance rate: 85% (2.5% exclusion zone); $r^2 - 0.35$

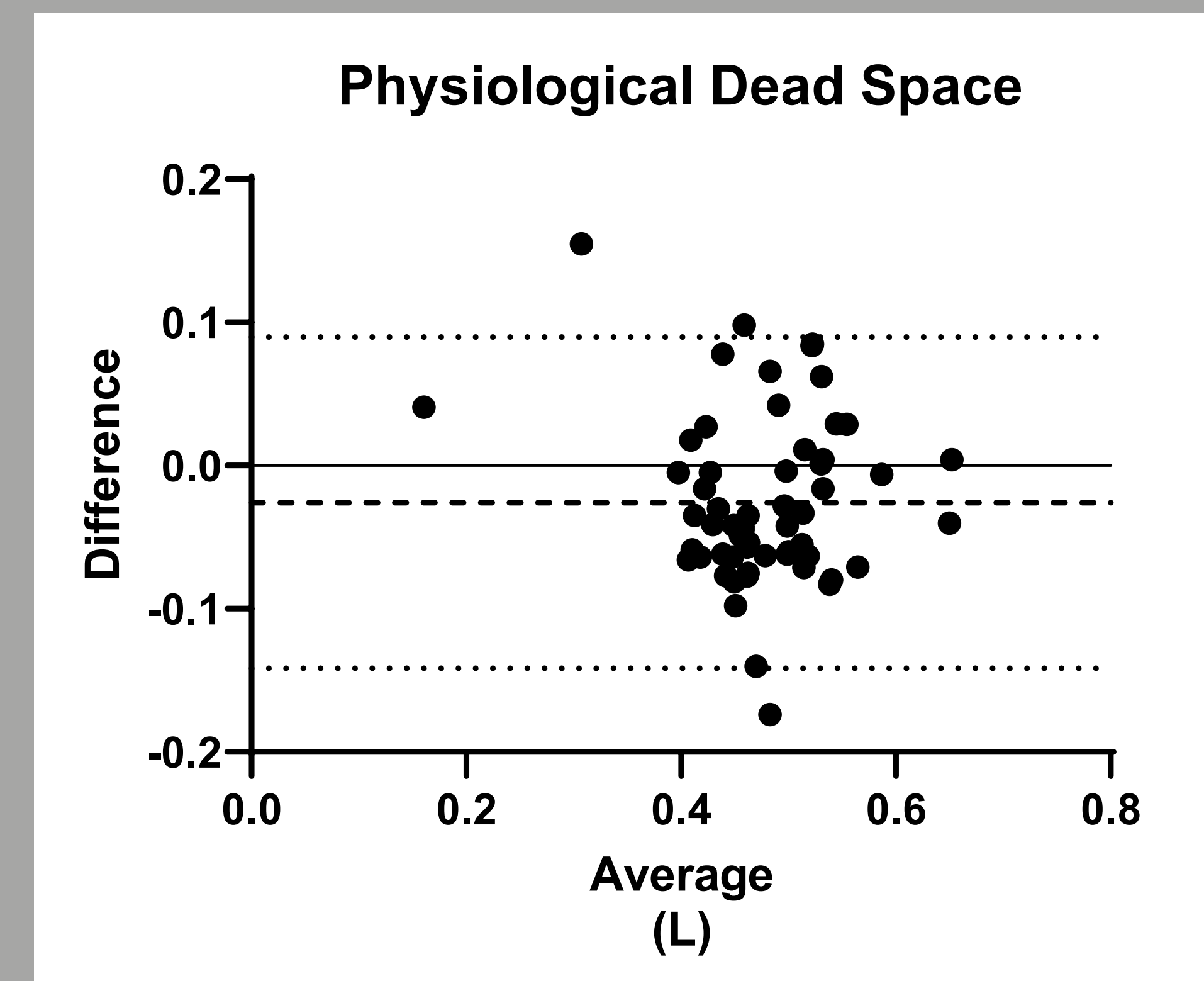


Figure 3: Agreement between our reference VD and values obtained using VQm PHM[™].

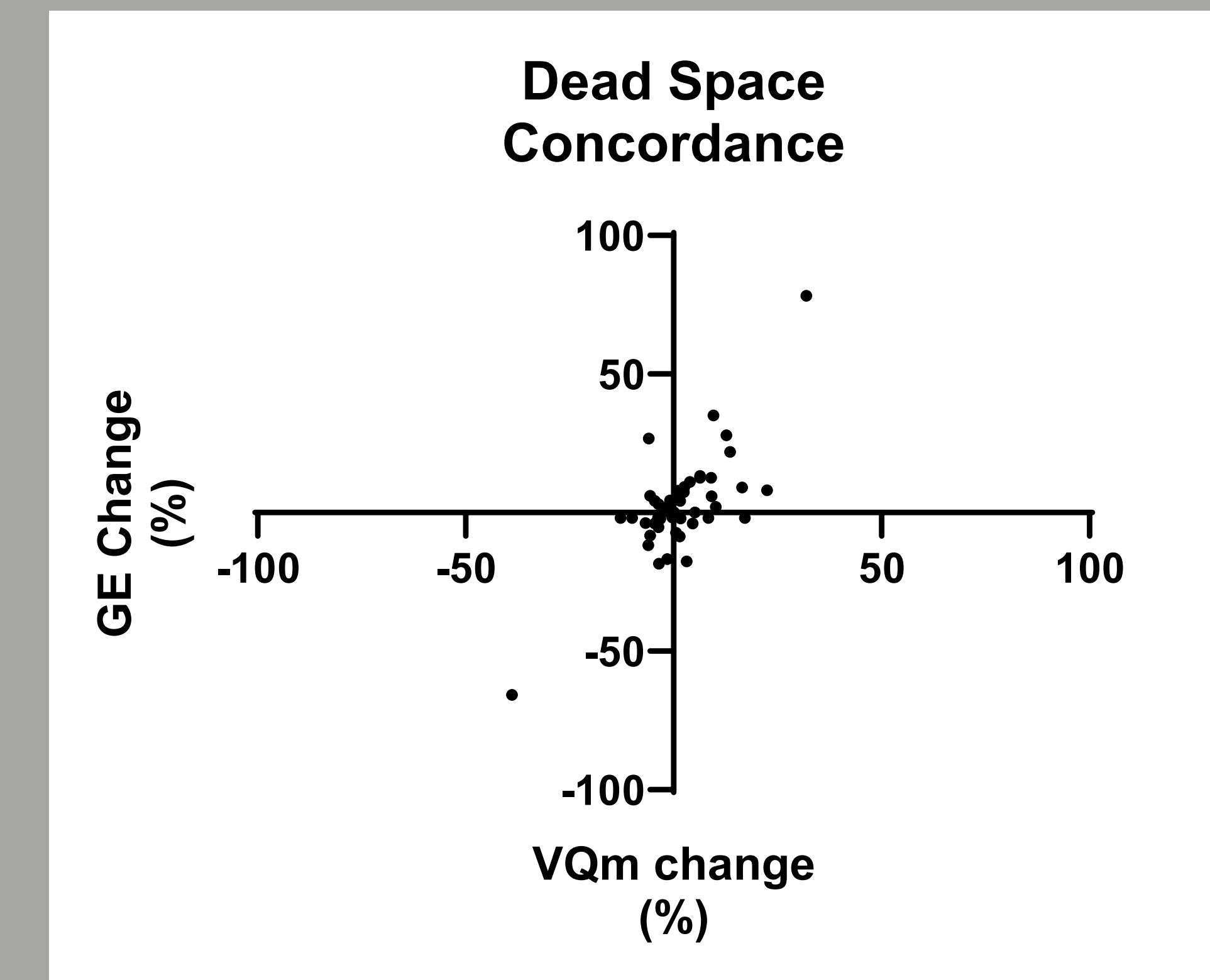


Figure 4: Direction of change between VQm PHM[™] VD and our reference VD. Concordance rate: 77% (2.5% exclusion zone); $r^2 - 0.91$

CONCLUSION

- Our results of this pilot study using the VQm PHM[™] indicate good agreement and trending for VD and good trending for FRC against current gold standard methods
- The VQm PHM[™] sequential gas technology also has capabilities to measure pulmonary blood flow and shunt fraction index, but the results are still being calculated.
- Future studies will explore the use of the VQm PHM[™] in ventilated patients in the ICU.

REFERENCES

1. Translational medicine communications. 2023;8(1). doi:<https://doi.org/10.1186/s41231-023-00146-8>

Download poster & Abstract:



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