

Category : **Respiratory: monitoring**

A154 - Exploring non-invasive estimation of respiratory compliance during pressure support using respiratory oscillometry: a feasibility study

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Introduction:

Respiratory dynamics are used daily to assess and follow disease evolution in intubated ventilated ICU patients. Dynamic respiratory compliance (C_{DYN}) estimation is typically performed only during controlled ventilation.

During assisted ventilation, invasive methods are necessary to have adequate estimates. However, respiratory oscillometry (RO) superimposes a specific designed, low-amplitude waveform on top of the ventilation and measures the resulting flow, which is used to derive the compliance [1]. This study explores the feasibility of using RO for non-invasive respiratory compliance estimation during assisted ventilation. The results are an interim analysis of the first study patient of the McInvent trial.

Methods:

Intubated, stable patients are included for this explorative feasibility test. Low-frequency RO is applied three times in a row, using a novel setup [1], and compared with the results of the standard of care C_{DYN} estimator [2], using a two-arm crossover design. The measurements are performed twice a day when the patient is on volume control ventilation (VC) and can be continued when ventilation is switched to pressure support (PS).

Results:

The two measurement sessions were performed on PS (n=6) and on VC (n=6). The mean compliance estimated by RO (C_{RO}) during VC was 42.6 ml.hPa⁻¹ (95% CI 38.7–46.4) and statistically equivalent to C_{DYN} . During PS, the mean C_{RO} and C_{DYN} were 32.6 ml.hPa⁻¹ (95% CI 28.6–36.6) and 810.7 ml.hPa⁻¹ (95% CI -1751.2–3372.5), respectively (Fig. 1).

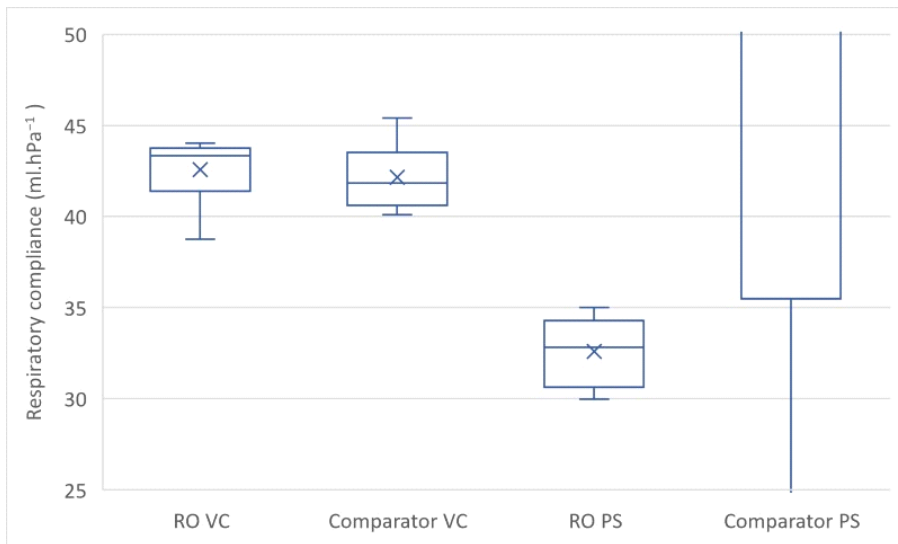
Conclusion:

Low-frequency RO was feasible and well-tolerated by the patient during PS. The C_{RO} during PS was closer to the compliance measured during VC than the comparator, C_{DYN} during PS, which produced unreliable results as expected. However, a difference in C_{RO} between the two ventilation modes can be observed, disease evolution is a plausible reason. To validate and generalize the results, more patient data is required.

References:

1. Keymolen A et al. MeMeA IEEE 1-6, 2023
2. Bates JH. Cambridge University Press, 2009

Image :



Comparison of Respiratory Compliance Estimation Methods: Standard (comparator) vs. Oscillometry (RO) during Volume-Controlled (VC) and Pressure-Support (PS) Ventilation. During VC, both estimators agree, exhibiting minimal variability between replicates. In PS, only the RO estimation aligns closely with the VC estimations, maintaining low variability between replicates. However, a notable decrease in the mean value is observed for RO when transitioning from VC to PS.