

Airwave oscillometry to assess lung mechanics in non-intubated patients with acute hypoxemic respiratory failure: preliminary report

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Rationale: Lung mechanics may determine the need for intubation and risk of patient self-inflicted lung injury, but mechanics are challenging to assess in non-intubated patients with acute hypoxemic respiratory failure (AHRF). This study aims to test the feasibility of using airwave oscillometry (AOS) to monitor lung mechanics in non-intubated patients with AHRF.

Methods: Non-intubated patients aged ≥ 18 years receiving oxygen with a flow rate ≥ 10 L/min and $FiO_2 \geq 0.40$ were prospectively recruited. Exclusion criteria: mechanical ventilation ≥ 24 hours during current hospitalization, body mass index ≥ 40 kg/m², pregnancy, structural thoracic pathology, acute exacerbation of COPD or asthma as primary cause of AHRF, inability to cooperate. The AOS measurement was performed on the day of enrolment and repeated after resolution of AHRF using the TremoFlo® (model C-100, Thorasys, Montreal, Canada).

Results: After screening 34 patients (13 of whom were ineligible because the technique was deemed infeasible), three patients (2 males and 1 female) were enrolled. All the patients had been hospitalized with AHRF due to COVID-19. Both baseline and follow-up measurements were completed with nadir saturation of 86%. Data for patient 3 are shown in Figure 1. At the peak of hypoxemia, respiratory system resistance R_{rs} was increased whereas changes in reactance AX were consistent with increased lung stiffness and heterogeneity of ventilation. These features were less pronounced after resolution of AHRF.

Conclusion: Preliminary results suggest that patients with AHRF display distinct patterns of dynamic changes in lung mechanics as measured by AOS. AOS may be a feasible tool to monitor respiratory mechanics in non-intubated patients with AHRF.

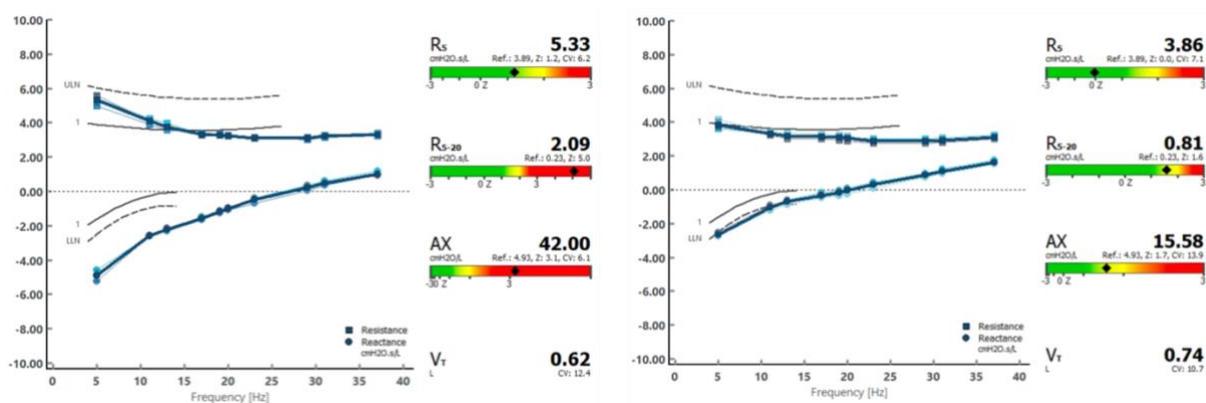


Figure 1: Respiratory system impedance in patient 3 in acute hypoxemia (left panel) and after its resolution (right panel)

1. Oostveen E, et al. The forced oscillation technique in clinical practice: methodology, recommendations and future developments. Eur Respir J. 2003;22(6):1026-41.