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LETTER TO THE EDITOR

Rethinking respiratory assessment: the emerging role of non-invasive P_{mus} estimation in real-time monitoring

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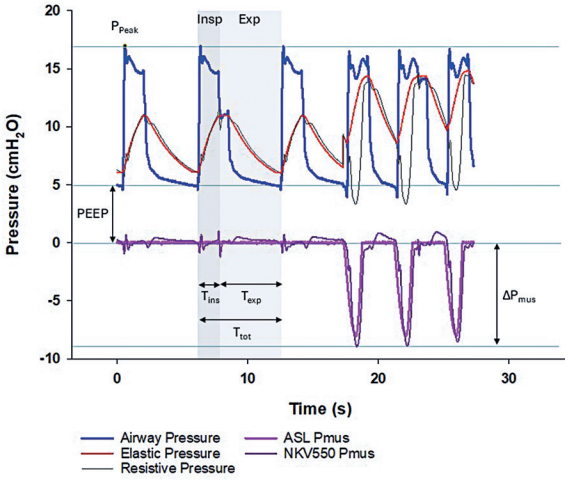
Dear Editor,

Monitoring patient effort or muscle pressure (P_{mus}) during mechanical ventilation is essential to prevent diaphragm injury.[1-3] Excessive inspiratory effort may cause patient self-inflicted lung injury and diaphragm overuse, whereas insufficient effort may result in rapid diaphragm atrophy.[4]

Both under- and over-assistance can disrupt the balance required to preserve respiratory muscle function.[1-3,5] Quantifying P_{mus} enables clinicians to tailor ventilator support, ensuring protective lung strategies while maintaining appropriate diaphragmatic activity.[1]

Traditionally, patient effort has been assessed using invasive techniques, such as esophageal pressure monitoring, which require specialized equipment and clinician expertise.[5] However, recent advances have enabled the development and integration of noninvasive methods for P_{mus} assessment in modern ventilators. These systems calculate P_{mus} based on the equation of motion using real-time measurements of respiratory system compliance and resistance. This approach enables accurate breath-by-breath, real-time monitoring of patient effort, offering a reliable and user-friendly alternative to invasive methods while supporting continuous bedside assessment (Figure 1).



The waveform is generated from data collected during simulated spontaneous breathing using the Active Servo Lung 5000 (ASL 5000, Software Version 3.6; IngMar Medical, Ltd., 2016; Pittsburgh, PA, United States) and NKV-550 ventilator (Nihon Kohden OrangeMed, LLC, Santa Ana, California, United States).
Exp: expiration; Insp: inspiration; PEEP: positive end-expiratory pressure; ΔP_{mus}: muscle pressure; P_{peak}: peak pressure; T_{exp}: expiratory time; T_{ins}: inspiratory time; T_{tot}: total time.
Figure 1. Chart representing the muscle pressure and the airway, elastic, and resistive pressures

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All authors are employees of Nihon Kohden OrangeMed, LLC (Santa Ana, California, United Sates). The authors declare that this affiliation may represent a minimal potential conflict of interest. However, all efforts have been made to ensure the integrity and objectivity of the manuscript. The authors declare no other conflicts.

AUTHORS' CONTRIBUTION

Ricardo Kenji Nawa, Germano Forti Junior and Marcelo do Amaral Beraldo: conceptualization, investigation, methodology, project administration, supervision, validation, visualization, writing - original draft, and writing – review & editing. All the authors have read and approved the final version of the manuscript.

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