Reviewer's report

Title: The effect of changing ventilator settings on indices of ventilation inhomogeneity in small ventilated lungs

Version: 1 Date: 31 May 2006

Reviewer: George Hatzakis

Reviewer's report:

General

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Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

To achieve efficiency in clinical interventions we need to quantify the extent of any possible abnormalities in the lung function or to evaluate the effect of nebulised medication. Therefore, a measuring technique of functional residual capacity (FRC) is required. Multiple breath gas washout (MBW) techniques have been successfully used albeit with problems associated to the type of gas used, potential leaks in the circuit and overall inaccuracies in the measurements especially in the case of small lung volumes. Despite whatever technical mishaps, MBW is considered a suitable technique for measuring FRC and ventilation distribution. The authors embarked on this study to evaluate whether changes in tidal volume (VT), FRC and Peak Inspiratory Pressure (PIP) affected surrogate indices [lung clearance index (LCI), the moment ratios M1/M0, M2/M0, and the alveolar based mean dilution numbers AMDN1, AMDN2] to ventilation inhomogeneity (VI). Other investigators (U.Frey et al) have published on the effect of tidal volume and forced flow patterns in infants and have demonstrated the effect of these parameters on FRC and ventilation distribution. The authors use sound experimental methods and demonstrate that alterations in PIP result in changes in the VI-indices. The findings of this study enrich our knowledge on the topic - still, it would be interesting to see some additional experiments, for instance how do the VI-indices change when while maintaining minute ventilation (VE) constant the VT or breathing frequency (f) [VE=VT*f] are altered. Also, how do the VI-indices change when the VE is altered following proportional/linear changes of either VT or f. Should the authors conduct these experiments, it would also be interesting to see how the authorsâ€™ model performs under these conditions. Eventually, can this model be applied realistically at the bedside and if so under what assumptions? Do the authors believe that inclusion of additional factors would be required in order to apply the model on humans? It would also be interesting to see whether the use of another ventilator could impact on the accuracy of the recordings (following necessary adjustments on the dead space) and whether comparable findings could be generated. Addressing these points would significantly increase the size of the manuscript but the final paper would constitute a unique contribution in this research area with direct clinical applicability.

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Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

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Discretionary Revisions (which the author can choose to ignore)

What next?: Unable to decide on acceptance or rejection until the authors have responded to the major compulsory revisions

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable

Statistical review: No
Declaration of competing interests:
I declare that I have no competing interests