Reviewer’s report

Title: Hyperinflation deteriorates arterial oxygenation and lung injury in a rabbit model of ARDS with repeated open endotracheal suctioning

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Reviewer: Erik K. Hartmann

Reviewer’s report:

Overall improved manuscript in comparison to first submission. The more puristic approach starts to reflect what the authors examined with their present protocol. Nevertheless, the main focus of the manuscript still needs considerable modifications and emphasis on the experimental character of the data.

Major Compulsory Revisions

1. The introduction lacks a clear hypothesis. What did the authors hypothesize before setting up this study?

2. The protocol compares one injurious procedure (saline-lavage ARDS) with repeated OES supposed to ARDS (two injurious procedures) and HI supposed to ARDS with OES (three injurious procedures). The injurious character of these procedures in high-PEEP ARDS should be emphasized.

3. Transferring the whole concept of disconnection from the ventilator, repeated OES and even manual hyperinflation to a clear-cut ARDS lung (whatever species, rabbit, pig or human etc.) that requires a high-PEEP application to maintain gas exchange and prevent end-expiratory collapse is far from every clinical standard.

Hence, the authors still focus too much on awarding their hyperinflation mode a kind of protective character, which at least in a real ARDS lung isn’t the case (and even confirmed by the author’s own data)!

Again, in my opinion the used hyperinflation mode following OES (PIP + 5, zero PEEP for 1 minute) is a highly injurious procedure for an ARDS lung!

4. The conclusions that the authors may draw from their present data are:

(1) If repeated OES in high-PEEP ARDS is inevitably, it significantly worsens gas exchange and pulmonary integrity.

(2) If uncritical or ill-conceived recruitment attempts leading to pulmonary hyperinflation are conducted following OES, this further aggravates the injurious effect.

5. The authors need to explain the present findings and mechanisms of lung injury.
The worsening of pulmonary function and injury by OES alone is easily explained by the repeated derecruitment and atelectasis formation within the ARDS lung, which is not fully re-opened by just continuing the previous ventilation.

But what is the cause for the further worsening in the HI group?
Is it really hyperinflation? (The present data, including the applied inspiratory pressures, offer no hints for this.)
Or does the injurious “hyperinflation” procedure without PEEP for 1 minute each just further aggravate the atelectasis formation and end-expiratory collapse going along with cyclical recruitment and derecruitment (atelectrauma) of the injured lung?

At least, the P/F ratio and the sharp drop of P/F within 1-2 hours suggest the latter.

Further take into account that you also applied a FiO2 of 100% and that the lung of a saline-lavaged rabbit tends to derecruit extremely fast (see Syring et al. JAP 2008, Baumgardner et al. Am J Resp Crit Care Med 2001).

6. Unfortunately the authors were unable to examine this issue by extended respiratory monitoring like EIT, CT etc. However, there is a magnitude of studies (experimental and clinical) dealing with concept of atelectasis and recruitment and alveolar collapse in ARDS the authors can refer to instead of just stating the occurring mechanisms remain unclear.

7. Despite improvements the manuscript is still very raw in terms of syntax, grammar, text editing. Reading is quite long-winded.

8. The manuscripts needs to be shortened significantly and focussed. I recommend leaving out the clinical discussion and the whole “lung-protective hyperinflation” topic. Just focus the experimental character of the data.

9. Material & Methods:
The anaesthesia regime is still questionable despite the single dose of ketamine for the preparation. Three hours of ventilation in ARDS using only sodium-phenobarbital and pancuronium appears to be critical in terms of animal care.

10. Once again, please report the exact number of animals per group!

Minor Revisions
Introduction: Three hours is no “long-term” study!
Discussion: What does “pulmonary kinetics” mean?

Level of interest: An article of limited interest
Quality of written English: Not suitable for publication unless extensively edited

Statistical review: Yes, but I do not feel adequately qualified to assess the statistics.

Declaration of competing interests:
I declare that I have no competing interests