Reviewer’s report

Title: Pressure- versus volume-limited sustained inflations: recruiting the preterm lung.

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Reviewer: Helmut Hummler

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Polglase et al. report on an experimental study to test the hypothesis that a sustained inflation (S.I.) that targets a preset delivered volume/kg birth weight will provide a more consistent FRC and more homogeneous aeration that is achieved using a pressure-limited inflation and thereby reduces lung injury. The used preterm lambs and after instrumentation they randomised them to a pressure-controlled (40 cmH2O) or volume-controlled (15 ml/kg) group. They found that the volume-limited S.I. resulted in an increased pressure variability (as expected), but both achieved similar lung volumes after S.I. However arterial-alveolar oxygen difference after 15mins was better in the pressure-limited animals.

General considerations:

The data is very interesting for the neonatologist as S.I. are increasingly be advocated as the primary method of respiratory support, based on physiological evidence and animal data as well as some clinical data. This study is important as it adds further information on this procedure and helps to prepare future research projects as it points out on the fact that filling time with gas may be an important variable during S.I. Clinicians and researchers in the field will be very interested in this data! There are some issues which should be considered in a revised version of the manuscript:

2. Major compulsory revisions:

2.1. It is not clearly stated in the manuscript, but it seems that inspiratory volume was measured during the S.I. (primary outcome) The technique of this measurement should be given.

2.2. The animals were intubated with cuffed tubes. Using an upper pressure limit of 50 cmH2O in the volume-controlled arm may have resulted in an endotracheal tube leak which may be compensated in the pressure-controlled arm completely, but in the volume-controlled arm (controlling for inspiratory volume) only partially. The authors should delineate how the can be sure that different levels of leak may have caused a smaller FRC by the end of the 15s pressure/volume hold. Did they assure the absence of leak?

2.3. Data on lung volume is the primary outcome measure. The legend of figure 6 does not even give the information if this is the mean or median and does not show variability. Please give the information and add standard deviations or
25/75th percentiles.

2.4. The abstract states that "...both achieved similar end-expiratory lung volumes..." Figure 1 and 6 suggest that it is the end-inspiratory volume (at the end of the Si.I.) which was measured. Please clarify!

2. Minor Essential Revisions:

2.1. Did the authors measure expired volume when animals were switched from the end of S.I. to volume-controlled ventilation? If yes, were these volumes consistent with the inspired volumes?

2.2. As stated in the methods section the animals were suctioned from the trachea after intubation. This is not the usual approach in the delivery room where only the upper airways are cleared from overt secretions. Furthermore, different suction volumes may have caused different filling conditions with amniotic fluids. This issue should be considered as a limitation in the discussion.

2.3. Data on NIRS and on hemodynamics should be presented (i.e. in a table)

2.4. Was the tube clamped to prevent spontaneous inspiration during instrumentation and delivery?

3. Discretionary Revisions:

3.1. I am not sure if the US guidelines on newborn resuscitation advocate the use of S.I. (page 5, third paragraph). Please check and eventually revise.

3.2. A more rapid filling with air in the presence of a fluid FRC may cause different distribution of fluid/air as compared to a slower filling procedure. It might be worthwhile to discuss this issue.

Level of interest: An article of outstanding merit and interest in its field

Quality of written English: Acceptable

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