Author’s response to reviews

Title: Comparison of volume-controlled ventilation mode and pressure-controlled ventilation with volume-guaranteed mode in the prone position during lumbar spine surgery

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Version: 1 Date: 22 Apr 2019

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Re: Comparison of volume-controlled ventilation mode and pressure-controlled ventilation with volume-guaranteed mode in the prone position during lumbar spine surgery

Dear Dr. Melidoni,

Thank you for your valuable comment. Point-by-point answers are listed below and those with yellow highlight were inserted in the revised manuscript.

1. Technical comments: Please add a section "Additional files" (after the Tables) where you list the following information for each additional-supplementary file in the file inventory

   -> We attached a section “Additional files”.

2. It is unclear to me why the authors have defined T0, T1, T2, and T3. I would prefer that they simply be recorded as 15 minutes after positioning, 30 minutes after positioning, etc. It is less confusing to the reader. I would prefer this in all the Tables and Figures.
Overall this manuscript is not sufficiently novel. It already known that pressure-controlled ventilation produces lower Ppeak values and higher Cdyn values. Doing this in prone patients undergoing spine surgery does not sufficiently improve the novelty to merit publication.

Although PCV has been shown to produce lower Ppeak and higher Cdyn values, there have been few studies comparing VCV and PCV-VG, as PCV-VG has only recently been introduced in the field of anesthesiology. We found no reports comparing VCV and PCV-VG in the prone position.

3-1. The idea of comparing VCV and PCV-VG in anesthetized patients is not new. For example in patients undergoing urologic surgery in the prone position an almost identical study has shown very similar results (Sen O et al. Springerplus. 2016 Oct 10;5(1):1761. eCollection 2016.). Considering these data and others studies on mechanical ventilation in prone patients during anesthesia and surgery what is the novel concept you wish to demonstrate?

PCV-VG uses decelerating flow and constant pressure and has the advantages of VCV and PCV. It delivers the desired tidal volume at the lowest possible pressure, and does not require frequent manual adjustment of inspiratory pressure during the course of surgery. Several studies compared VCV and PCV during various types of surgery, but there have been no studies comparing VCV and PCV-VG in the prone position.

3-2. No clear null hypothesis is presented.

3-3. 36 patients scheduled for lumbar spine surgery in the prone position were enrolled. Did you perform biometrical analysis to assess the sample size and if so, why didn’t you present this information in the section methods?

We presented this information in Method section (Page 6).

3-4. You state that primary outcome variable is Ppeak. However, this variable per se has little importance for clinical anesthesiologists unless unphysiologically high limits are surpassed. Did you expect excessive Ppeak (e.g. > 30 cmH2O) with conventional VCV in your patients?

Yes. Patients with lung disease or BMI > 30 kg/m² were excluded in our study.

3-5. Hemodynamic and respiratory variables including arterial blood gases were assessed in the supine position 15 min after the induction of anesthesia (T0), 15 min (T1) and 30 min after prone positioning (T2), and 15 min after supine positioning at the end of anesthesia (T3). Why didn’t you measure these variables in the postoperative course?
We expected that the VCV and PCV-VG modes of ventilation would not show superiority for improving postoperative oxygenation, so we planned to measure these variables intraoperatively.

3-6. The statistical analysis is not clear. You state that analysis of variance and two-sample t-test were used. Have you analyzed your data for normal distribution?

We used the two-sample t test or Mann–Whitney U test to compare differences at the same time point.

3-7. A presentation of median and confidence intervals would be more appropriate for your clinical data.

Data are displayed as the median and interquartile ranges.

3-8. The patients were fairly healthy according to your inclusion and exclusion criteria. However in patients with unimpaired cardiopulmonary function relatively short periods of VCV or PCV have little impact on outcome. Why didn’t you study patients with pre-existing lung disease to see whether VCV or PCV-VG has clear advantages? Please comment.

We compared the effects of VCV and PCV-VG in the prone position. Respiratory mechanics or hemodynamics may be affected in various lung conditions in the prone position and we wanted to standardize the lung function of the participants. The problem noted by the reviewer represents a limitation of our study.

3-9. The uncalibrated pulse contour analysis is no good choice to measure hemodynamic variables during different conditions of mechanical ventilation. You discuss this point in the section "Limitations" but provide no explanation why this device was used at all for a scientific study.

We felt that transpulmonary thermodilution using a pulmonary catheter or transesophageal echocardiography would be more invasive to the patients than pulse contour analysis. As a calibrated pulse contour analysis device was not available in our center, we used an uncalibrated pulse contour analysis device as a less invasive means of measuring hemodynamic variables.

3-10. Your data on arterial pCO2 show that your patients were slightly hyperventilated. Would you expect different results between the groups during normocapnia? Please comment.

We expect similar results in both groups during normocapnia.

3-11. The differences for Ppeak are quite small. What is the clinical impact of △Ppeak of 2 to 3 cmH2O between both groups of patients?

3-12. Likewise the differences for Cdyn are small. I have the impression you present statistical differences which have little importance for management of anesthesia and mechanical ventilation in prone patients.
Ppeak was significantly lower in the PCV-VG group than the VCV group. Although airway pressure values in our study were within the normal range, lower pressure would provide better lung protection and be advantageous in patients with compromised lung function. Cdyn decreased after placement in the prone position, which was related to increased Ppeak, and Cdyn was significantly higher in the PCV-VG group than the VCV group. A decrease of about 25% in Cdyn was observed in the VCV group after placement in the prone position. The decrease of Cdyn would have a significant effect in patients with preexisting lung disease.

3-13. It is no use to present 2 decimal places in your tables.

4. 41-43 line: there were lower Ppeak values in the PCV-VG group than in the VCV group (p = 0.045, Fig. 2). Did Ppeak values including all time points in one group was compared with those of the other group? I think it is inappropriate. There were two factors (body position and ventilation mode) and should be compared separately

45-47 line: Cdyn was lower in the VCV group than in the PCV-VG group (p = 0.040, Fig. 3)

Problem is same as mentioned above. The comparison in same group was to emphasize the difference of body position, The comparison between the two groups was to emphasize the difference of ventilation mode

We compared the differences in Ppeak and Cdyn values over the study time points using repeated measures analysis of variance. The effects of both body position and ventilation mode would influence the results. We also compared the study groups at each time point using the t test (effect of ventilation mode), while within-group comparisons between different time points (e.g., T0 vs. T1, T0 vs. T2, and T0 vs. T3) were performed using the paired t test (effect of body position).