Letter to the Editor

Lung protective ventilation and thoracic anesthesia

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Provenance: This is an invited article by the Section Editor Shuangjiang Li (Department of Thoracic Surgery and West China Medical Center, West China Hospital, Sichuan University, Chengdu, China).

Response to: Milman S, Ng T. Protective ventilation for lung cancer surgery, the truth likely lies somewhere in the middle. J Thorac Dis 2019;11:373-5; Girrbach FF, Pietsch UC, Wrigge H. Optimizing intraoperative ventilation during one-lung ventilation—is individualization the road to success? J Thorac Dis 2019;11:S343-6.

Pasin L. Protective intraoperative ventilation during thoracic surgery: definitively yes! J Thorac Dis 2019;11:S341-2.

Hu XY, Du B. Lung-protective ventilation during one-lung ventilation: known knowns, and known unknowns. J Thorac Dis 2019;11:S237-40.

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We appreciate the different comments on the study that we performed and published recently (1). The Pulmonary surgery with protective ventilation (PPV) trial compared lung ventilation using large tidal volume without positive end expiratory pressure (PEEP), i.e., a traditional ventilator strategy frequently used during anaesthesia in the last 25 years, to the lung PPV (LPV). LPV aims to minimize ventilation-induced lung injury by using low tidal volume to limit overdistension and by applying PEEP and lung recruitment manoeuvers to prevent lung collapse and atelectasis. Between 1998 and 2006, three randomized controlled trials have demonstrated that lung-PPV with low tidal volumes and airway pressures reduces mortality in acute respiratory distress syndrome (2). Some years ago, large tidal volumes were still used during thoracic surgery especially because one study documented that the highest PaO_2 during OLV was achieved with a tidal volume of 14 mL/kg and no PEEP (3). The protocol of our study was written in 2006. At this time, there was no direct evidence that LPV during anaesthesia decreases the incidence of major postoperative complications. On the contrary, the used of large tidal volumes for one lung ventilation (OLV) was a matter of controversy (4). In 2018, a survey showed that most anaesthesiologists focused during OLV, on minimizing peak airway pressure (PAP) as their primary strategy of intraoperative LPV, rather than decreasing tidal volume (5). Respondents to this survey reported trying to keep PAP below a mean value of 30.3±5.8 cmH_2O. In the control group of the PPV trial, the PAP was 28.0±6.5 with a mean tidal volume of 9.6±0.9 mL/kg of ideal body weight. In this situation, many practitioners would consider that one-lung ventilation is correct and would not decrease the tidal volume. This is also the opinion of Milman and Ng in their editorial, that stated "*higher tidal volume can be safely delivered as long as plateau airway pressure is closely monitored and maintained at less than 30 cmH_2O*" (6). We think that large tidal volume should be avoided during thoracic surgery because this practice has an impact in the postoperative with an increase incidence of pulmonary complications.

We decided to use a pragmatic protocol applying the same tidal volume and PEEP during all the procedure. In the lung-PPV group, the tidal volume was fixed and scaled to the IBW. The level of PEEP was also fixed. We agree with the editors that lung-PPV could be performed differently during one-lung ventilation. An individualized approach that tailoring tidal volume and PEEP on residual functional capacity, lung CT scan finding, dynamic compliance, impedance tomography, mechanical power and/or driving pressure is possible. A recent trial performed in thoracic surgery, has indeed documented that driving pressure-guided ventilation during one-lung ventilation, was associated with a lower incidence

of postoperative pulmonary complications, compared to conventional PPV (7). This suggests that different strategies are valuable for LPV during thoracic surgery.

Eventually, we agree that no benefit was observed on mortality in the current study when LPV was used, despite the decrease in the incidence of pulmonary complications. However, mortality does not depend on a single risk factor.

In conclusion, the value of the PVV trial is to warn against the use of large tidal volume without PEEP during thoracic surgery. It suggests that another ventilator strategy is possible in agreement with previous studies performed during major surgery (8).

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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