Transpulmonary Pressure-Guided Invasive Ventilation in Morbidly Obese Patients: Another Brick in the Wall of Personalized Medicine

In this issue of the Journal, Rowley and colleagues[1] present the results of an early intervention performed in a monocentric series of 20 morbidly obese subjects who received invasive mechanical ventilation, mainly for medical reasons. Of note, body mass index was extremely high in the series, and most of the subjects exhibited severe or moderate ARDS classification for hypoxemia according to the Berlin definition.[2] The intervention consisted of the insertion of an esophageal probe, which allowed targeting of a positive expiratory transpulmonary pressure. The intervention led to modification of mechanical ventilator settings in nearly all of the subjects, most often by increasing the level of applied PEEP from 14 to 18 cm H_2O. Of note, the authors reported an improvement in respiratory system compliance and oxygenation, as well as a decrease in airway and transpulmonary driving pressures, while the inspiratory transpulmonary pressure remained at the same level. The authors also reported good clinical results, including low mortality rate.

The authors should be congratulated for their report on the interest of a rigorously applied personalized approach in this subset of ICU patients, even if some inherent limits, already well discussed in the paper, can be mentioned. Their approach assumed that the absolute value of esophageal pressure can act as surrogate of pleural pressure in the dependent lung regions, a concept that is not uniformly accepted, perhaps in part because of a lack of systematic rigorous assessment of the validity of the esophageal pressure signals in some studies or in clinical practice, which is in contrast with the rigorous methodology of Rowley and colleagues.[1] Another very positive point is the early initiation of measurements and consequently application of new mechanical ventilator settings, possibly preventing deleterious alveolar de-recruitment and cyclic closing-reopening phenomenon in some patients. Another major point is the report of the safety profile not only of esophageal measurements but also of the new mechanical ventilator settings, confirming mainly good respiratory and cardiovascular tolerance of the approach. Finally, the authors performed a complete literature review, with a sound interpretation of their own results as compared to other published series.

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Nevertheless, some limits are to be mentioned. The first one is the absence of a control group, which could have added strength to the results, as in the recently published study of Florio et al,[3] who used a historical control group of their own lung rescue team interventions, based on similar concepts. Another important limit is the absence of precise descriptions of mechanical ventilator settings adjustments throughout the ICU course, and more precisely of how the authors managed the decrease in applied PEEP settings prior to weaning from invasive mechanical ventilation. The 30° semi-recumbent position was judicious, by eliminating the excess pressure due to the cardiac compression on the low part of the esophagus.[4] However, comparing it to prone positioning could have been interesting. Indeed, prone position is now recognized as a life-saving intervention in patients with moderate to severe ARDS.[5] Comparing the respective effects of the 2 approaches, and more importantly of their combination, could have been of particular interest, especially in the more severe patients. In line with that, one should remember that prone positioning is technically feasible in morbidly obese patients, even if it requires obviously more nurses and medical staffing for mobilization. Finally, Rowley et al[1] didn't check their subjects for the presence of an airway closure phenomenon and, if present, determine the corresponding pressure value.[6] This could have added value because a high prevalence of the phenomenom has been described in morbidly obese patients, with values exceeding in some cases the pressure required to obtain a positive transpulmonary pressure based on esophageal and airway pressure measurements.[7] In such patients, expiratory transpulmonary pressure could be overestimated by a calculation based only on airway pressure measurement during an end-expiratory pause, and driving pressure could be

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Correspondence: Jean-Luc Diehl. E-mail: jean-luc.diehl@aphp.fr.
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accordingly overestimated. In such cases, a higher PEEP setting with the aim to counteract the airway closure phenomenon may have been preferred.

Some perspectives could also be discussed, such as the interest to implement calculation of inspiratory transpulmonary pressure corrected by the elastance ratio in addition to the parameters studied by Rowley and colleagues.[8,9] By choice, motivated by the limits of the method, the authors chose not to use this approach. However, the potential interest of the elastance ratio method is to provide an indication of the transpulmonary pressure in the nondependent lung regions, therefore providing an indication of the risk of overdistention. It is striking to observe that some groups don't rely on the parallel between the absolute value of esophageal pressure and the pleural pressure in the dependent lung regions, while others are reluctant to use the elastance ratio method. However, it could be of particular importance to use both parameters, with the aim to achieve mechanical ventilation settings that offer the best compromise between recruitment and overdistention.[9,10] Another perspective, allowed by some esophageal medical devices, would be to study the importance of inspiratory efforts after cessation of paralysis, if needed, and after stopping sedative drugs. Indeed, preventing deleterious inspiratory muscular efforts is an important challenge for patients with ARDS. Moreover, quantifying the level of inspiratory efforts, in its elastic and resistive components, in such morbidly obese ICU patients would add to our knowledge and potentially would help to adapt the level of ventilator support.

Finally, the use of esophageal pressure monitoring could also be put in perspective with other methods of applying personalized invasive mechanical ventilation, such as imaging studies, either by electrical impedance tomography,[11] lung and diaphragm echography, computed tomography studies, or end-expiratory lung volume measurements.[12] It seems likely that combining such methods could help achieve highly personalized invasive mechanical ventilation. Determination of the clinical impact of such approaches in morbidly obese patients represents an interesting field of research in the coming years, extending results of studies such as this one by Rowley and colleagues.

Jean-Luc Diehl
Department of Intensive Care
Biosurgical Research Lab (Carpentier Foundation)
Georges Pompidou European Hospital
Paris, France
Department of Innovative Therapies in Hemostasis
INSERM UMR_S 1140
Université de Paris
Paris, France

Marion Placais
Marine Rolland
Department of Intensive Care
Biosurgical Research Lab (Carpentier Foundation)
Georges Pompidou European Hospital
Paris, France

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