Letter to the Editor

Prone positioning acute respiratory distress syndrome patients

Claude Guérin[1,2,3]

[1]Réanimation médicale, Hôpital de la Croix Rousse, Hospices civils de Lyon, Lyon, France; [2]Université de Lyon, Lyon, France; [3]IMRB, U955 Inserm–Université Paris Est Créteil, Créteil, France

Correspondence to: Claude Guérin. Service de réanimation médicale, Hôpital de la Croix Rousse, 103 Grande Rue de la Croix Rousse, 69004 Lyon, France. Email: claude.guerin@chu-lyon.fr.

Provenance: This is an invited article commissioned by the Section Editor Dr. Zhiheng Xu (State Key Laboratory of Respiratory Disease, Guangzhou Institute of Respiratory Disease, Department of Intensive Care, The First Affiliated Hospital of Guangzhou Medical University, Guangzhou, China).

Response to: Pugliese F, Babetto C, Alessandri F, *et al.* Prone positioning for ARDS: still misunderstood and misused. J Thorac Dis 2018;10:S2079-82. Hepokoski ML, Odish M, Malhotra A. Prone positioning in acute respiratory distress syndrome: why aren't we using it more? J Thorac Dis 2018;10:S1020-4.

Submitted Apr 19, 2018. Accepted for publication May 10, 2018.

doi: 10.21037/jtd.2018.05.109

View this article at: http://dx.doi.org/10.21037/jtd.2018.05.109

I read with great interest the editorials of my esteemed colleagues regarding the Apronet study (1). This study aimed at making a picture of the use of prone position (PP) in acute respiratory distress syndrome (ARDS) in the current time and to explore the reasons to not proning these patients. I thank *Journal of Thoracic Disease* (*JTD*) for providing me the opportunity to share some comments with them.

Pugliese *et al.* (2) pointed out that the rate of use of PP in the Apronet study may have been overestimated from the design of the study. This argument is very interesting and at the time the Apronet study was designed was not discussed. It is based on the fact that for the purpose of the Apronet study investigators were informed on the dates, had the choice between different times and were prepared to the study. All of this may have forced them to use PP the days of the study something they wouldn't have been doing outside the study context. My problem with this argument is that such design is common in any prospective epidemiological study, like lung safe (3) as an example. If this argument is true prospective epidemiological data does overestimate the true rate of the event under investigation. The only way to avoid this bias would be, therefore, to retrospectively look at the data, which were recorded without the "scrutiny" bias. Another comment pertaining to the argument of overestimation is that the Apronet study mostly involved European ICUs and in particular ICUs from Italy, Spain and France. In these countries intensivists conducted the five largest trials on PP (4-8). Therefore, it is highly likely that PP is used in routine there and, hence it is unlikely, in my opinion, that indication of PP was forced by study design in the Apronet study.

I do agree with Pugliese *et al.* (2) regarding the way the ventilatory and non-ventilatory strategies should be deciphered in relation with the temporal trend of ARDS severity. In the PROSEVA trial (8), a 12-hour stabilization period was mandated before inclusion to confirm the ARDS and assess its severity at standardized settings. However, PP should/must be used more quickly in patients with very severe ARDS once neuromuscular blocking agents, positive end expiratory pressure (PEEP) and nitric oxide have failed to restore a safe oxygenation level. In some ICUs patients like this may not receive PP and are given ECMO straight ahead. The rate of complications due to PP was low in the Apronet study. This may result from a real improvement in practice or an underreporting. Complications attributable to PP have been put forward in the early days of PP and were used for the detractors of the technique to avoid it. It should be mentioned that in none of the trials on PP, the PP group had a significant worst outcome, suggesting that, at the population level, the impact of these complications was less than it was claimed. To date, PP is a safe technique. It is also a simple one and should not be made too complex. As an example, the complications rate was higher in the

Italian PS2 trial (7) in the group of patients in which PP was performed by using a special bed as compared to the own patient bed. Patients under ECMO can be proned safely (9,10). Patients referred to our center for ECMO evaluation are sometimes transported in the PP.

Hepokoski *et al.* (11) emphasized on the prevention of ventilator induced lung injury (VILI) as the main mechanism for the beneficial effect of PP found in trials. This hypothesis is highly likely from the strong pathophysiological background that embedded PP and supports the use of prolonged PP sessions. The longer the application of PP the more efficient the VILI prevention would be. VILI prevention should be disconnected from gas exchange improvement as underlined by Hepoposki *et al.* Even though hypoxemia is not the main reason for death in ARDS patients an acute profound hypoxemia can occur and be life-threatening. Henceforth, PP can be an immediate rescue procedure. In the PROSEVA trial we observed a twice lower rate of cardiac arrest in the PP group than in the control group. Even though the real mechanism subtending cardiac arrest was not investigated in this trial, it could be that PP avoided cardiac arrest from profound hypoxemia. However, the maintenance of prolonged PP sessions, as long as needed, should not be based on oxygenation response. In trials, oxygenation response was not associated with better survival (12,13). Therefore, apart from a deleterious effect of PP on oxygenation, PP should be applied irrespective of the oxygenation response. This contention implies to deal with the issue of PP interruption. Currently the most used criterion is oxygenation-based. In the PROSEVA trial we defined PP weanibility from oxygenation criterion at specific settings in the supine position. May be new tools available at the bedside like electrical impedance tomography that allow measuring regional ventilation and perfusion could be used to define the optimal duration of the PP session. Hepokoski *et al.* (11) also judiciously emphasized on the hemodynamic effect of PP. In the Apronet study (14), the clinicians were reluctant to use PP for the risk of hemodynamic impairment. This was the second reason for not proning ARDS patients, though well after the not severe enough hypoxemia criterion. Worrying the risk of hemodynamic impairment from PP is not supported by the data. Beside the arguments developed by Hepokoski *et al.*, I may add the fact that in the PROSEVA trial there were two days without cardiovascular dysfunction more in the PP group than in the control group (8). The prevention of ventilator associated pneumonia (VAP) could be a mechanism by which PP improved survival. Favoring the clearing of secretions as commonly observed during PP was a relevant rationale for this. However, in the PROSEVA trial the rate of VAP was not reduced in PP (15).

Acknowledgements

None.

Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

References

1. Guerin C, Beuret P, Constantin JM, et al. A prospective international observational prevalence study on prone positioning of ARDS patients: the APRONET (ARDS Prone Position Network) study. Intensive Care Med 2018;44:22-37.
2. Pugliese F, Babetto C, Alessandri F, et al. Prone Positioning for ARDS: still misunderstood and misused. J Thorac Dis 2018. [Epub ahead of print].
3. Bellani G, Laffey JG, Pham T, et al. Epidemiology, Patterns of Care, and Mortality for Patients With Acute Respiratory Distress Syndrome in Intensive Care Units in 50 Countries. JAMA 2016;315:788-800.
4. Guerin C, Gaillard S, Lemasson S, et al. Effects of systematic prone positioning in hypoxemic acute respiratory failure: a randomized controlled trial. JAMA 2004;292:2379-87.
5. Gattinoni L, Tognoni G, Pesenti A, et al. Effect of prone positioning on the survival of patients with acute respiratory failure. N Engl J Med 2001;345:568-73.
6. Mancebo J, Fernandez R, Blanch L, et al. A multicenter trial of prolonged prone ventilation in severe acute respiratory distress syndrome. Am J Respir Crit Care Med 2006;173:1233-9.
7. Taccone P, Pesenti A, Latini R, et al. Prone positioning in patients with moderate and severe acute respiratory distress syndrome: a randomized controlled trial. JAMA 2009;302:1977-84.
8. Guerin C, Reignier J, Richard JC, et al. Prone positioning in severe acute respiratory distress syndrome. N Engl J Med 2013;368:2159-68.
9. Kimmoun A, Guerci P, Bridey C, et al. Prone positioning use to hasten veno-venous ECMO weaning in ARDS. Intensive Care Med 2013;39:1877-9.

10. Kimmoun A, Roche S, Bridey C, et al. Prolonged prone positioning under VV-ECMO is safe and improves oxygenation and respiratory compliance. Ann Intensive Care 2015;5:35.
11. Hepokoski ML, Odish M, Malhotra A. Prone positioning in acute respiratory distress syndrome: why aren't we using it more? J Thorac Dis 2018;10:S1020-4.
12. Lemasson S, Ayzac L, Girard R, et al. Does gas exchange response to prone position predict mortality in hypoxemic acute respiratory failure? Intensive Care Med 2006;32:1987-93.
13. Albert RK, Keniston A, Baboi L, et al. Prone position-induced improvement in gas exchange does not predict improved survival in the acute respiratory distress syndrome. Am J Respir Crit Care Med 2014;189:494-6.
14. Guérin C, Beuret P, Constantin JM, et al. A prospective international observational one-day prevalence study on prone positioning in ARDS. The APRONET study. Intensive Care Medicine Experimental 2017;5:44.
15. Ayzac L, Girard R, Baboi L, et al. Ventilator-associated pneumonia in ARDS patients: the impact of prone positioning. A secondary analysis of the PROSEVA trial. Intensive Care Med 2016;42:871-8.

Cite this article as: Guérin C. Prone positioning acute respiratory distress syndrome patients. J Thorac Dis 2018;10(Suppl 17):S2092-S2094. doi: 10.21037/jtd.2018.05.109