

Should we put pressure on using lower levels of PEEP in patients without ARDS in the Netherlands?

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To the Editor,

Recently in your journal, Van IJzendoorn *et al.* presented a post-hoc analysis comparing Dutch with European ICU ventilation practices.¹ Apart from the finding that tidal volumes were lower and levels of positive end-expiratory pressure (PEEP) were higher in Dutch compared with European ICUs, there are some other prominent differences.

The incidence of unplanned extubations in Dutch ICUs is higher than in European ICUs (28.6 versus 13.9%, $p < 0.01$), and the percentage of reintubations after unplanned extubations is lower (2.4% versus 20%, $p < 0.01$). This low incidence of reintubations after unplanned extubations suggests there is a group of patients whose planned extubation has been delayed.² But the most remarkable difference between Dutch and European ICUs is the PEEP level used in patients without ARDS (8.0 [6.0-9.5] versus 6.0 [5.0-8.0] cm H₂O, $p < 0.01$). Van IJzendoorn *et al.* suggest that 'a certain PEEP level is needed to achieve the optimal lung volume at which the alveoli stay open'.¹ This finding in preclinical studies, however, may not at all translate into benefits in patients. Indeed, higher PEEP levels have been found beneficial only in patients with moderate or severe ARDS.³ While randomised controlled trial evidence for higher PEEP levels in ICU patients without ARDS is absent, a recent randomised controlled trial in patients with healthy lungs receiving short-term ventilation during general anaesthesia for surgery shows that higher PEEP levels were not beneficial, and maybe even harmful.⁴ The suggestion that higher PEEP levels in patients with healthy lungs was recently confirmed in an individual patient data meta-analysis.⁵

Could it be that use of higher PEEP levels in Dutch ICUs is associated with longer durations of ventilation? Indeed, intensivists tend to extubate ICU patients at the

'lowest' PEEP level, which is generally 5 cm H₂O.⁶ A recent post-hoc analysis of two randomised controlled trials showed that a change from using higher PEEP to lower PEEP levels was associated with a shorter duration of ventilation in post-cardiac surgery patients in a Dutch ICU.⁷

Evidence for harm from mechanical ventilation is rapidly growing.⁸ Use of too large tidal volumes causes harm. Unrestricted use of high PEEP levels (i.e. using higher levels of PEEP in patients who do not have moderate or severe ARDS) could also worsen outcome.

REFERENCES

1. van IJzendoorn MC, Koopmans M, Strauch U, et al. Ventilator setting in ICUs: comparing a Dutch with a European cohort. *Neth J Med.* 2014;72:473-80.
2. Krinsley JS, Barone JE. The drive to survive: unplanned extubation in the ICU. *Chest.* 2005;128:560-6.
3. Briel M, Meade M, Mercat A, et al. Higher vs lower positive end-expiratory pressure in patients with acute lung injury and acute respiratory distress syndrome: systematic review and meta-analysis. *JAMA.* 2010;303:865-73.
4. Hemmes SN, Gama de Abreu M, Pelosi P, et al. High versus low positive end-expiratory pressure during general anaesthesia for open abdominal surgery (PROVHILO trial): a multicentre randomised controlled trial. *Lancet.* 2014;384:495-503.
5. Serpa Neto A, Hemmes SNT, Barbas CSV, et al. Protective Ventilation with Low Tidal Volume and High PEEP Versus Conventional Ventilation with High Tidal Volume and Low PEEP in Patients Under General Anesthesia for Surgery: A systematic review and individual patient data meta-analysis. *Anesthesiology.* 2015; [in press].
6. Boles J-M, Bion J, Connors A, et al. Weaning from mechanical ventilation. *Eur Respir J.* 2007;29:1033-56.
7. Dongelmans DA, Hemmes SN, Kudoga AC, et al. Positive end-expiratory pressure following coronary artery bypass grafting. *Minerva Anesthesiol.* 2012;78:790-800.
8. Slutsky AS, Ranieri VM. Ventilator-induced lung injury. *New Engl J Med.* 2013;369:2126-36.