

POSTER PRESENTATION

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# Automatic monitoring of plateau and driving pressure during pressure and volume controlled ventilation

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## Introduction

Plateau pressure (Pplat) limitation is routinely used to avoid ventilator-induced lung injury. Recently, driving pressure ( $\Delta P$ ) was strongly associated with survival in ARDS patients [1].

## Objectives

To evaluate the feasibility of  $\Delta P$  and Pplat continuous monitoring during volume (VCV) and pressure (PCV) controlled ventilation, we compared with gold standard (occlusion maneuvers at end-inspiration and end-expiration) two different methods: 1- Least Square Fitting (LSF) method that provide maneuver-free Pplat and  $\Delta P$  values; 2- Mini Occlusion (MO) method by performing brief occlusion maneuvers.

## Methods

We enrolled 22 patients admitted to our ICU after scheduled major abdominal surgery, with normal or restrictive respiratory system mechanics under pressure (12 pts) and volume (10 pts) controlled mechanical ventilation (G5, Hamilton Medical). We studied 12 different conditions in each patient by changing respiratory rate (10-15-20-25 bpm) and I:E ratio (1:2, 1:1, 2:1). Inspiratory pressure in PCV and tidal volume (TV) in VCV were adjusted to keep end-tidal CO<sub>2</sub> between 32 and 36 mmHg. PEEP and FiO<sub>2</sub> were set to maintain SpO<sub>2</sub>  $\geq$  95%.  $\Delta P$ , Pplat and PEEPtot reference values ( $\Delta P_{REF}$ , Pplat<sub>REF</sub> and PEEPtot<sub>REF</sub>) for each ventilatory setting were obtained by 5s-length occlusion maneuvers at end-inspiration and end-expiration ( $\Delta P_{REF} = Pplat_{REF} - PEEPtot_{REF}$ ).  $\Delta P_{MO}$  values were calculated as: Pplat<sub>MO</sub> - PEEPtot<sub>MO</sub>, Pplat<sub>MO</sub> and PEEPtot<sub>MO</sub> being

average airway pressure in the last 100 ms of mini-occlusion maneuvers lasting 400 ms. LSF applied over the whole respiratory cycle provided Pplat<sub>LSF</sub> and Crs<sub>LSF</sub> values, being Crs the compliance of the respiratory system.  $\Delta P_{LSF}$  was calculated as TV/Crs<sub>LSF</sub>.

## Results

Difference with reference values was greater for MO vs. LSF, both for  $\Delta P$  ( $0.82 \pm 0.41$  vs.  $0.46 \pm 0.82$  cmH<sub>2</sub>O, respectively;  $p < 0.001$ ) and Pplat ( $0.52 \pm 0.33$  vs.  $0.02 \pm 0.49$  cmH<sub>2</sub>O;  $p < 0.001$ ).

## Conclusions

Both methods provided a good estimation of  $\Delta P$  and Pplat; MO showed a slightly better precision than LSF, but a greater bias, being these differences not clinically relevant. Anyway, LSF is a totally continuous and non invasive method, whereas MO method minimally interferes with mechanical ventilation and its implementation on ICU ventilators could be more troublesome.

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## Reference

1. Amato BPMarcelo, et al: Driving pressure and survival in the acute respiratory distress syndrome. *N Eng J Med* 2015, **372**:747-55.

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