Driving pressure and postoperative pulmonary complications in adult cardiac surgery

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Background and Goal of Study: Driving Pressure (DP) is the difference between the plateau pressure (P_{plateau}) and the Positive End-Expiratory Pressure (PEEP), and estimates the lung strain. In general surgery DP >13 cmH₂O has been associated with an increased incidence of Postoperative Pulmonary Complications (PPCs)¹. The aim of this study is to evaluate the predictive power of DP for clinical outcome in adult cardiac surgery.

Materials and Methods: This is a prospective observational study. After the Ethics Committee's approval, 200 patients were continuously enrolled from December 2015 to January 2017. We collected data provided by the anaesthesia machine: tidal volume, PEEP, FiO₂, peak and P_{plateau}, lung compliance and DP. DP was measured after anaesthesia induction and at the end of surgery. Chi-square test was used for dichotomous variables, z-test/t-test or the Mann-Whitney U-test for continuous variables, as appropriate. Statistical significance if p < 0.05.

Results and Discussion: The median DP after induction and at end of surgery were 12 (10-15) cmH₂O and 13 cmH₂O (10-16) cmH₂O, respectively. A total of 87 patients (43.5%) had DP >13 at anaesthesia induction, 104 (52%) at the end of surgery.

DP >13 cmH₂O compared to DP ≤13 cmH₂O at anaesthesia induction yielded lower PaO₂/FiO₂ ratio at ICU discharge (271.2±118.8 vs 322.02±109.4 mmHg, respectively; p=0.002),

higher need of Non Invasive Mechanical Ventilation (NIMV) (44.8% vs 22.1%, respectively; χ^2 11.6; p=0.001) and an higher incidence of respiratory failure (67.8% vs 50.4%; χ^2 6.09; p=0.02). DP after anaesthesia induction showed also a weak correlation with both ICU stay (p 0.158; p=0.026) and hospital stay (p 0.178; p=0.012).

DP >13 at the end of surgery yielded lower PaO₂/FiO₂ ratio at ICU discharge (282.78±110.1 vs 318.5±122.5 mmHg, respectively; p=0.032) and higher need of NIMV (41.3% vs 21.9%; p=0.003).

Conclusion(s): Monitoring DP during anaesthesia in cardiac surgery could help to identify those patients at increased risk of PPCs and optimise PEEP setting within the protective ventilation strategies.

1. Neto et al. Association between driving pressure and development of postoperative pulmonary complications in patients undergoing mechanical ventilation for general anaesthesia: a meta-analysis of individual patient data. *Lancet Respir Med* 2016. 4.4: 272-280.