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Pleth Variability Index Versus Stroke Volume Variation as Predictors of Fluid Responsiveness in Prone Position

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Introduction: Hypovolemia may become evident when the patients are made prone, owing to decrease in cardiac index (CI) and stroke volume (SV). This study was designed to investigate the effects of prone position on the accuracy of pleth variability index (PVI) to predict fluid responsiveness, and to correlate the changes in stroke volume variation (SVV) with PVI in prone position.

Methods: After Institutional Ethics Committee approval, 51 adults of either gender, aged 18-65yrs, belonging to ASA physical status I-II, undergoing elective spine surgery in prone position were included. Heart rate (HR), blood pressure, cardiac output (CO), stroke volume index (SVI), SVV, CI, perfusion index (PI), and PVI were recorded before and after volume expansion with 500ml of hetastarch 6% given twice; in supine and after prone position. A Masimo pulse oximeter probe was placed on the index finger and connected to a Radical-7 monitor. A radial artery was cannulated and was connected to the Vigileo monitor with an interface FloTrac transducer (Edwards Lifesciences). The above parameters were recorded at different time intervals: 5 min after induction (baseline), after first volume expansion, after making the patient prone, and after second volume expansion.

Results: Mean age of the patients was 41yrs; most were males (M:F= 33:18). After first volume expansion, the SVI was increased by 12% and was associated with a 32.5% reduction in the SVV ($p=0.00$), and PVI was decreased by 48.3% ($p=0.00$). After second volume expansion, the SVI was increased by 9.2%, SVV was reduced by 2.3% ($p=0.00$), and PVI was decreased by 38.1% ($p=0.00$), as compared to the previous values. In supine position, the volume-induced increase in SVI was at least 15% in 22 patients (responders) and less than 15% in 29 patients (non-responders). Similar values were obtained in prone position; 19 patients were responders and 32 were non-responders. In supine position, there was no significant difference between the area under ROC curve for SVV (0.745) and PVI (0.611) with respect to identifying a change in SVI greater than 15%. The best threshold values to predict fluid responsiveness in supine position were more than 12% for both SVV and PVI. Similarly, in prone position, there was no significant difference between the area under the ROC curve for SVV (0.638) and PVI (0.532). The best threshold values to predict fluid responsiveness were more than 9% and 11% for SVV and PVI, respectively.

Conclusion: Both SVV and PVI are useful indicators of fluid responsiveness in mechanically ventilated patients undergoing spine surgery. Non-invasively measured PVI seems to provide an accurate

alternative for continuous monitor of preloading. SVV and PVI correlated well, in prone position, with regard to fluid responsiveness.