

Title: An Observational Study Comparing Intrathoracic Pressure Changes and stroke volume variation with Abdominal Insufflation: Stroke Solome variation vs. Esophageal pressure

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Student's Role: Assisted with data acquisition, collaborated on data analysis, drafted and collaborated on data presentation

Background: Stroke volume variation (SVV) is a well-founded predictor for fluid responsiveness in mechanically ventilated patients.¹ Additionally, esophageal pressure (Pes) is an accepted method of determining transpulmonary pressure and estimation of intrathoracic pressure.² The current literature regarding the changes in stroke volume variation and pulse pressure variation with pneumoperitoneum are sparse and conflicting. The objective of this study is to compare and correlate predictive agreement between esophageal pressure and Edwards ClearSite hemodynamic measurements with abdominal insufflation.

Methods: The Human Subjects Research Committee approved a single-site, non-randomized, prospective study. The participants recruited for the study were adult patients undergoing elective laparoscopic surgery with general anesthesia and abdominal insufflation. The patients were categorized as ASA I-III adult patients. The tidal volume was standardized by ideal body weight and the positive end-expiratory pressure was standardized to 5 cm H₂O. The pre- and post- insufflation mean systolic and diastolic esophageal pressure, lung compliance, and stroke volume variation, cardiac output, blood pressures were measured. The ClearSite device connected to the Edwards HemoSphere advanced monitoring platform to measure stroke volume variation and cardiac output. An esophageal balloon catheter was inserted after induction to measure esophageal pressure with optimized waveform. A paired T-test was performed to analyze stroke volume variation, CO lung compliance, blood pressure with ClearSite monitoring versus esophageal balloon catheter.

Results: A total of 25 patients undergoing general abdominal surgery were included in this study. 18 female patients and 7 male patients were recruited for the study. Abdominal insufflation to 15 mm Hg increased the variability of esophageal pressure swing. The esophageal pressure swing varied from 3 ± 1.5 cm H₂O to 3.8 ± 2 cm H₂O. There was a significant increase in stroke volume variation with abdominal insufflation. The mean in stroke volume variation prior to abdominal insufflation was 9.4 ± 4 , and the mean in stroke volume variation after abdominal insufflation was 11 ± 4.7 .

Conclusion: In this study, abdominal insufflation was associated with an increase in esophageal pressure and lung compliance. There was also a corresponding increase in stroke volume variation. Future research should confidently establish the relationship between abdominal insufflation, esophageal pressure, and lung compliance. This prospective study elucidates the relationships between pneumoperitoneum, esophageal pressure, and lung compliance, and future areas of research must be done to study the relationship between stroke volume variation and esophageal pressure.

References:

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