

hTEE measured SVC index: A useful tool for predicting fluid responsiveness in the trauma patient

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Introduction

Echocardiography has proven to be an essential diagnostic and monitoring tool for the rapid evaluation of the hemodynamic state in the critically ill patient. Both transthoracic echocardiography (TTE) and continuous transesophageal echocardiography (hTEE) are being increasingly utilized to assist with complex resuscitations and to monitor the hemodynamic profiles of these critically ill patients. Previous research has demonstrated that TTE captured inferior vena cava (IVC) collapsibility with respiratory variation can be useful in determining patient fluid responsiveness. Similarly, hTEE allows for serial measurements of the superior vena cava (SVC) collapsibility, SVC index calculation, and estimation of fluid responsiveness. The objective of this study was to demonstrate that SVC index is comparable and therefore an alternative tool to IVC respiratory variability index (IRVI) in predicting fluid responsiveness.

Methods

Critically ill trauma patients in the intensive care unit of a Level 1 Trauma Center were followed from January 2014 to May 2014. Where hTEE was being performed for hemodynamic monitoring purposes, a surgical intensivist also simultaneously performed TTE exams. 28 comparison examinations were captured (n=28). TEE exams were performed using ImaCor hTEE (ZuraEVO ZT1000) and TTE exams were performed using a Sonosite (MTurbo/2007-2012) machine (Figure 1). SVC maximum and minimal areas were acquired for calculation of a SVC index by the hTEE ImaCor software. IVC diameters, Dmax at end inspiration and Dmin at end expiration, were obtained from TTE to calculate an IVC respiratory variation index, IRVI=(max-min/mean).

Midesophageal



Transgastric





Above – hTEE position with corresponding views below On right – TTE position with corresponding views lettered

Figure 2 – SVC v IVC



28 examinations were obtained with IVC and SVC measurements being compared.

Figure 1 – TTE v hTEE



<u>SVC</u>



Previous studies have established cutoff percentages at which fluid responsiveness is predicted; 12% for IRVI, and 36% for SVC index. When IRVI predicted fluid responsiveness in the ventilated trauma patient, the simultaneously obtained SVC index of change also predicated fluid responsiveness with statistical significance (Figure 2). ANOVA, regression, and concordance statistics were completed comparing the SVC with IVC measurements for each encounter with significance (p < 0.05).

Conclusions

A statistically significant correlation between IVC and SVC measurements of fluid responsiveness was demonstrated in mechanically ventilated trauma patients. Some variance exists in the linearity of the results, but overall the data supports the use of hTEE captured SVC index as an alternative method for assessing fluid responsiveness in the trauma patient. The SVC index is particularly useful in trauma patients for whom IVC measurements are difficult to obtain or may be unreliable. Further studies are needed to evaluate those trauma patients in whom the SVC and IVC indices of fluid responsiveness differ in order to determine if one measurement is superior in its ability to provide the most useful clinical information for the ongoing resuscitation of the trauma patient.

Methods

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