

Comparison of Stroke Volume and Fluid Responsiveness Measurements in Commonly Used Technologies for Goal-Directed Therapy

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Study Objective

To compare stroke volume (SV) and preload responsiveness measurements from different technologies with the esophageal Doppler monitor (EDM).

Design

Prospective measurement study.

Setting

Operating room.

Patients

20 ASA physical status 3 patients undergoing vascular, major urological, and bariatric surgery.

Interventions

Subjects received fluids using a standard Doppler protocol of 250mL of colloid administered until SV no longer increased by >10%, and again when the measured SV decreased by 10%.

Measurements

Simultaneous readings of SV, stroke volume variation (SVV) and pulse pressure variation (PPV) from the LiDCOrapid, and SVV from the FloTrac/Vigileo were compared with EDM measurements. The pleth variability index (PVI) also was recorded.

Main Results

No correlation was seen in percentage SV change as measured by either the LiDCOrapid ($r=0.05$, $P=0.616$) or FloTrac ($r=0.09$, $P=0.363$) systems compared with the EDM. Correlation was present between the LiDCOrapid and FloTrac ($r=0.515$, $P<0.0001$). Percentage error compared with the EDM was 81% for the FloTrac and 90% for the LiDCOrapid. SVV as measured by LiDCOrapid differed for fluid responders and nonresponders (10% vs 7%; $P=0.021$). Receiver operator curve analysis to predict a 10% increase in SV from the measured variables showed an area under the curve of 0.57 (95% CI 0.43-0.72) for SVV FloTrac, 0.64 (95% CI 0.52-0.78) for SVV LiDCO, 0.61 (95% CI 0.46-0.76) for PPV, and 0.59 (95% CI 0.46-0.71) for PVI.

Conclusions

Stroke volume as measured by the FloTrac and LiDCOrapid systems does not correlate with the esophageal Doppler, has poor concordance, and a clinically unacceptable percentage error. The predictive value of the fluid responsiveness parameters is low, with only SVV measured by the LiDCOrapid having clinical utility.