Comparing Pulmonic and Aortic Velocity-Time Integral-Derived Cardiac Output Parameters in Dogs Receiving Intravenous Fluid Challenges: A Preliminary Study

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Transaortic Doppler echocardiography may be used to assess cardiac output (CO) and fluid responsiveness (FR). Given the principle of conservation, transpulmonic-derived parameters could be similar to transaortic-derived parameters, providing an alternative way to measure CO. This study aimed to evaluate the agreement between transaortic and transpulmonic-derived CO parameters before and after a fluid challenge and investigate if increases in transaortic stroke volume [SV] ≥15% (i.e. FR) after a fluid challenge are associated with similar transpulmonic measurements. A preliminary analysis was planned at 50 datapoints.

Dogs in the emergency or intensive care services receiving a fluid challenge (7.5 ml/kg of isotonic crystalloids over 5 minutes) were prospectively enrolled. Dogs were excluded if any arrhythmia (including sinus arrhythmia) was present or the necessary views could not be obtained. Recorded parameters before and after fluid challenge were aortic and pulmonic valve diameter; transvalvular peak flow velocity and velocity-time integrals; heart rate, and weight. Calculated parameters included SV, SV index, minute distance, CO and cardiac index. Absolute and relative (i.e. delta) changes after the fluid challenge were calculated.

Differences between paired measurements were assessed using paired Student T-tests. Agreement was assessed using the Intraclass Correlation Coefficient (ICC) and its 95% confidence intervals (95% CI). Variation was assessed using coefficients of variation (CV).

Fifty-three paired datapoints were collected from 36 dogs. The pulmonic valve diameter was greater than the aortic valve (p=0.037). The pre-fluid SVs showed excellent agreement (ICC [95% CI]=0.939 [0.915–0.964]) though wide CV (20%); the post-fluid agreement was similarly excellent (ICC [95% CI]=0.941 [0.918–0.965]) with wide CV (19.1%). Forty-one out of fifty-three paired datapoints demonstrated positive FR (increase in SV range 16–81%); 12 were FR negative. With FR, the deltas for transaortic peak velocities, velocity-time integrals, SVs, SV indexes, minute distances, COs and cardiac indexes were larger. The absolute changes in transaortic and transpulmonic-derived SVs showed poor agreement (ICC [95% CI]=0.431 [0.217–0.627]) with enormous CV (95.8%); the relative changes showed poor agreement (ICC [95% CI]=0.143 [−0.129–0.382]) and CV (14.8%). There was no association between FR positivity and deltas for any transpulmonic-derived parameters.

The agreement between transaortic and transpulmonic-derived CO parameters before and after a fluid challenge was excellent, though the variation was large. Transpulmonic measured and derived CO parameters could not identify positive response to a fluid challenge in dogs in the emergency room or intensive care.

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Speaker Information

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