

Category : **Cardiovascular: Monitoring**

**A190 - Comparison of cardiac index measurement using continuous wave versus pulsed wave echo-doppler compared to pulse contour cardiac output.**

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**Introduction:**

This study assesses the accuracy of cardiac output (CO) derived from pulsed wave (PW) velocity time integral (VTI) at the left ventricular outflow tract (LVOT) versus continuous (CW) VTI at the aortic valve (AV) using calibrated PiCCO CO as a reference standard. CO assessments can be used in critical care to aid definition of shock status and guide resuscitation. Stroke volume (SV) and CO measurements can be obtained via Transthoracic Echocardiography (TTE) as can other methods via thermodilution techniques. CO is measured using the product of cross-sectional area (CSA) and VTI: typically using PW VTI at left LVOT.

**Methods:**

We performed a single centre, prospective, observational study in a 15-bed intensive care unit in a UK hospital. Patients had simultaneous measurements of cardiac index (CI) by PiCCO, TTE LVOT PW VTI and TTE AV CW VTI. The mean difference between modalities were measured, with Bland-Altman (B-A) limits of agreement (LOA), and percentage error (PE) calculations performed.

**Results:**

55 patients were assessed with 3 excluded due to AV disease therefore 52 results for all measurements. AV CI mean 2.7 L/min/m<sup>2</sup> (range 0.78 – 5.11, s.d. 0.92). LVOT CI mean 2.33 L/min/m<sup>2</sup> (range 0.77 – 5.40, s.d. 0.90). PICCO CI mean 2.86 L/min/m<sup>2</sup> (range 1.50 – 5.56, s.d. 0.93). AV CW VTI and PICCO mean difference was -0.16 L/min/m<sup>2</sup> PE 43.5%. LVOT PW VTI and PICCO had a mean difference of -0.54 PE 38.6%. AV CW VTI and LVOT PW VTI had a mean difference of 0.38 L/min/m<sup>2</sup> PE 46.0%. There was a non-significant difference between these all these modalities.

**Conclusion:**

This study shows that CI derived from both AV CW-VTI and LVOT PW-VTI methods underestimate CI compared to PiCCO, with the AV method having closer values overall to the PICCO method. AV CW-VTI may offer a more accurate assessment of SV.

**References:**

Arturo Evangelista, MD et al. Am Coil Cardiol 1995;25:710-6  
Critchley LA, and Critchley JA. J Clin Monit Comput 1999; 15: 85–91.  
Zhang Y et al.. PLoS ONE 14(10): e0222105.

**Table:**

Measurements	Mean difference L/min/m <sup>2</sup>	SD difference	95% B-A LOA	Percentage Error
AV CI & PICCO CI	-0.16	0.62	(-1.37, 1.05)	$1.96 \times 0.62 / 0.5 \times (2.70 + 2.86) = 43.5\%$
LVOT CI & PICCO CI	-0.54	0.51	(-1.53, 0.46)	$1.96 \times 0.51 / 0.5 \times (2.33 + 2.86) = 38.6\%$
AV CI & LVOT CI	0.38	0.59	(-0.77, 1.52)	$1.96 \times 0.59 / 0.5 \times (2.33 + 2.70) = 46.0\%$

Table to show Bland-Altman limit of agreement results