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Comparison of cardiac indices during pregnancy between USCOM and transthoracic echocardiography: a longitudinal study

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Objective

To compare cardiac indices (stroke volume [SV], cardiac output [CO], SV index [SVI], and cardiac index [CI]) measured by the Ultrasonic Cardiac Output Monitor (USCOM) and transthoracic echocardiography(TTE) across gestations in Chinese women.

Methods

This was a prospective longitudinal study involving 280 women with singleton pregnancies at the Prince of Wales Hospital, Hong Kong SAR, China. Cardiac indices, including SV and CO, were obtained by USCOM and TTE at 12–15 (n=280), 20–24 (n=262), and 30–37 (n=213) weeks of gestation. SVI and CI were derived from SV and CO, adjusting for body surface area. The performance of the USCOM was assessed by calculating the correlation coefficient, bias, precision, mean percentage difference (MPD), and 95% limits of agreement (LOA) between the two methods.

Results

Comparisons of SV and SVI by USCOM and TTE showed moderate correlations ($r=0.37, r=0.35$, both $P<0.01$) in the first trimester. USCOM had a bias of SV and SVI ranging from -3.7 ml to 1.4 ml and -2.1 ml to 0.9 ml, respectively. The MPD ranged from 56.3% to 75.6% for SV and from 56.0% to 74.9% for SVI. The overall 95% LOA spanned from -35.3 ml to 34.6 ml for SV and from -21.2 ml to 21.9 ml for SVI. Comparisons of the CO and CI measurements by the two approaches showed a significant moderate correlation during the first trimester ($r=0.42, r=0.40$, both $P<0.01$). USCOM had a bias of CO and CI ranging from -0.30 L/min to 0.04 L/min and -0.17 L/min to 0 L/min, respectively. The MPD ranged from 59.1% to 76.7% for CO and from 59.2% to 75.2% for CI. The overall 95% LOA adjusted for repeated measurements spanned from -2.99 L/min to 2.89 L/min for CO and from -1.80 L/min to 1.72 L/min for CI.

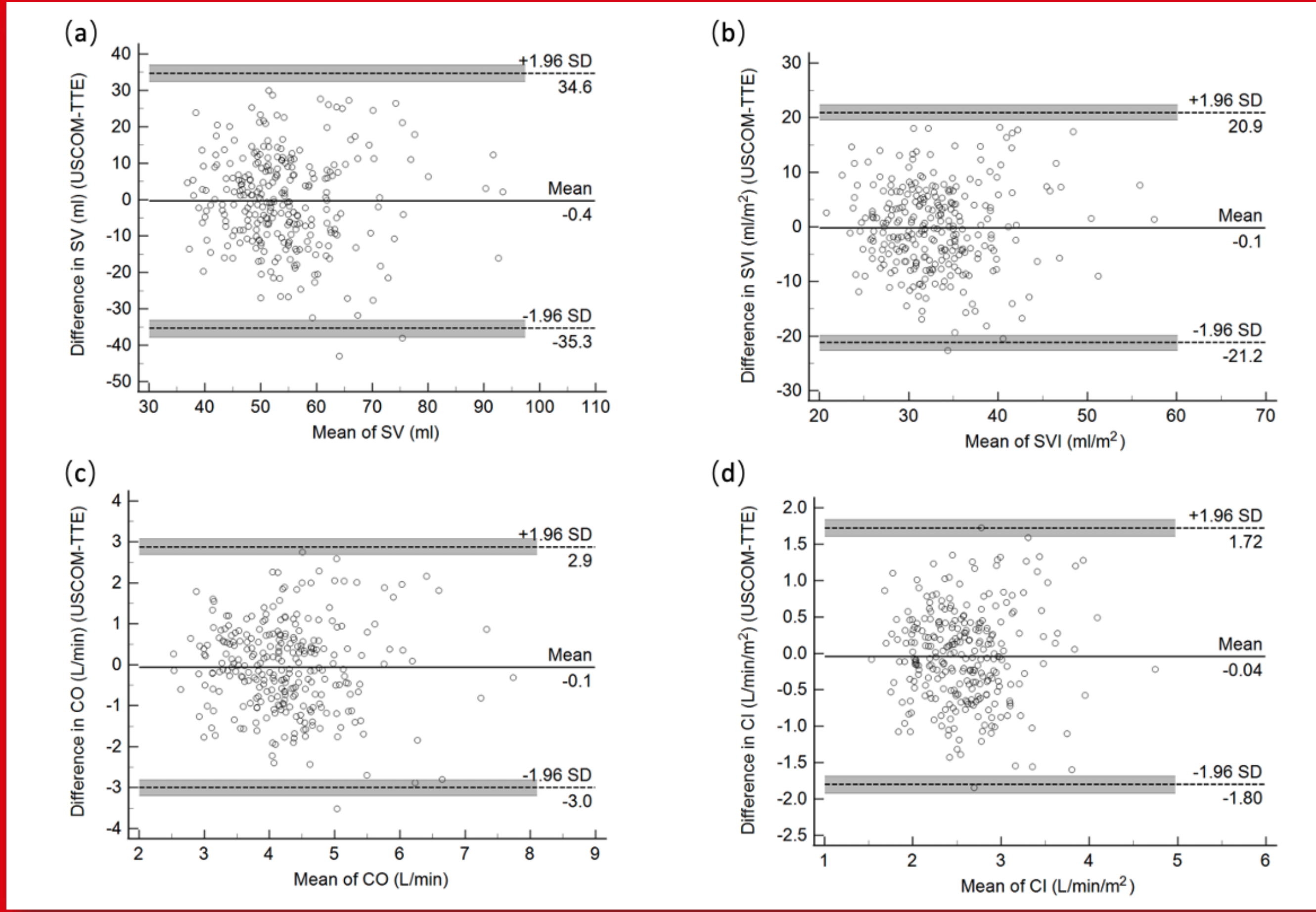


Figure 1. (A-D) Bland–Altman plot illustrating the agreement between USCOM and two-dimensional transthoracic echocardiography (2D-TTE) for stroke volume (SV)(a), stroke volume index (SVI)(b), cardiac output (CO)(c) and cardiac index(CI)(d). The cantered line presents bias between the two methods, and the dashed lines represent the limits of agreement (95%CI).

Conclusion

In Chinese pregnant women, USCOM systematically underestimates cardiac indices compared to those measured by TTE throughout pregnancy. The MPD for all cardiac indices is higher than the clinically acceptable limit, indicating limited clinical interchangeability.