

Bilateral Symmetry of Brachial Pulse Waveform Analysis in a Clinical Population

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Background: Pulse waveforms are modified as they propagate along the arterial tree. Small differences in the arterial pathways from the heart to the left and right brachial artery may impact pulse waveform analysis (PWA) for the purpose of hemodynamic assessment. The VaSera VS-1500AU (Fukuda Denshi) is a cuff-based device that permits simultaneous acquisition of bilateral brachial pulse volume recordings. To determine if interchangeability between left and right brachial pulse waveforms is possible, we assessed whether there are significant differences in pulse waveform analysis variables between each arm.

Methods: In 20 subjects (mean age=67±11 years) from a clinical population, simultaneous pulse waveforms were acquired at both the left and right brachial arteries. Following an initial recording, the cuffs were switched and a second series of continuous waveforms were acquired. Phonocardiograms were continuously acquired to determine timing of aortic valve closure. All PWA variables were averaged across the standard- and switched-cuff configurations to minimize the impact that slight variations in cuffs may impart on recordings. Extracted PWA variables include (1) brachial form factors (bFF), (2) heart-brachial transit time (hb-TT), and (3) brachial augmentation index (bAIx).

Results: Paired t-test revealed no statistically significant differences in left and right pulse waveform features ($P>0.05$ for BFF, hb-TT, bAIx). Bland-Altman analysis revealed no significant bias in extracted waveform features between each arm (mean bias [limits of agreement]=0.3 [-3.2, 2.7]%, -2.65[-1571.1, 1041.1] msec, 0.3[-1.15, 1.21]% for bFF, hb-TT, and bAIx, respectively).

Conclusion: No significant systematic differences exist between left and right pulse waveforms. Despite minor differences in arterial pathways between left and right brachial arteries, we found agreement in PWA variables between both arms. The side of measurement did not influence pulse waveform analysis results in this clinical sample.