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P2.09: DIASTOLIC “WAVE” BELIES ITS UNDERLYING MECHANICS

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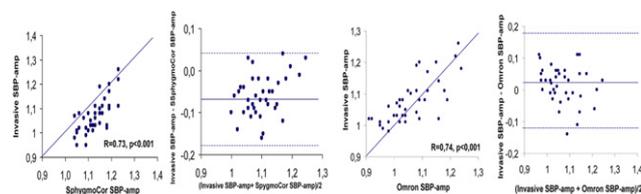
predictors of cardiovascular events beyond brachial BP. The non-invasive estimation of central BP is limited by the differences between invasive brachial BP and cuff-based BP measurements. SBP-amp and PP-amp, given their independence from BP, are less influenced by brachial BP input errors.

Objective: to compare SBP-amp and PP-amp given by Omron HEM9000AI and SphygmoCor devices with invasive SBP-amp and PP-amp.

Methods: during coronary angiogram, invasive BP was measured in ascending aorta and in the brachial artery after pulling back a 6F fluid-filled catheter in 40 patients (66±12 years, 88% males). Simultaneously, radial waveform was acquired by the two devices contralaterally, and brachial BP was measured oscillometrically. Radial waveform was calibrated to brachial SBP/DBP. Radial-to-aortic transfer function (SphygmoCor) or the second systolic peak (HEM9000AI) were used for central BP estimation. Amplification was calculated as brachial BP/central BP.

Results: invasive aortic and brachial BP were 139/71±18/10 mmHg and 146/68±18/10 mmHg. Both devices underestimated central SBP (HEM9000AI -6±11 mmHg, SphygmoCor -18±9, both p<0.001). Invasive SBP-amp was 1.05±0.07 while invasive PP-amp was 1.18±0.19. HEM9000AI provided reasonable estimates of SBP-amp and PP-amp (ΔSBP-amp -0.01±0.08, ΔPP-amp -0.06±0.21, both p=n.s.), while SphygmoCor overestimated both SBP-amp and PP-amp (Δ vs invasive 0.08±0.07 and 0.15±0.16, both p<0.001, Figure).

Conclusions: SBP-amp and PP-amp non-invasively estimated by HEM9000AI was in line with invasive SBP-amp and PP-amp, while SphygmoCor overestimated SBP-amp and PP-amp. Systematic measurement errors or other variables may be responsible for the difference between the two devices.



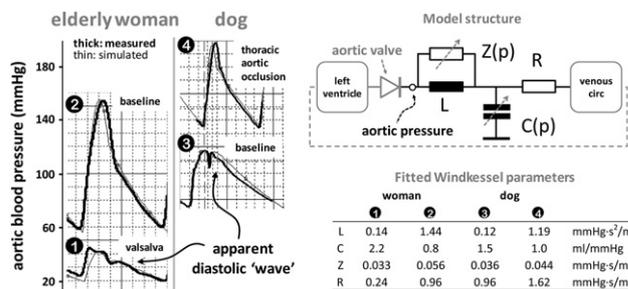
P2.09
DIASTOLIC 'WAVE' BELIES ITS UNDERLYING MECHANICS

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Aortic blood pressure waveforms in young normotensive subjects exhibit a wave-like amplitude increase in diastole (Figure). Current views contend that this signals a reflected wave which summates with the incident arterial pulse wave, producing the dicrotic pulse waveform. With arterial stiffness (thus pulse wave velocity) increasing with age, the reflected wave will arrive earlier, augmenting systolic pressure while the diastolic 'wave' disappears. This paradigm assumes ventricular-arterial interaction is a linear time-invariant system, which is questionable because arterial compliance is pressure-dependent and the system contains a valve. We studied the diastolic 'wave' in a non-linear time-varying model and based on pressure recordings in an elderly woman and a dog, both showing the presence of a diastolic 'wave' at lower pressure but none at higher pressure (Fig.). Our analyses show that at lower pressures total inertia maintains ventricular outflow whilst pressure declines before valve closure and that upon valve closure a diastolic 'wave' is induced by conversion of kinetic into potential energy by vascular inertia (L). At higher pressures the associated lower arterial compliance (C) caused the diastolic peak to occur earlier in time. However, to fully simulate the high pressure data, L had to be 10 times the value at lower pressure (Table). Our findings suggest that in young normotensive subjects interplay between inertia and compliance reduces systolic pressure and induces the diastolic 'wave', while in old hypertensive subjects these effects are absent. We conclude that the mechanics underlying the diastolic 'wave' may not comply with the wave reflection paradigm.



P2.10
COMPARISON OF THE VICORDER AND SPHYGMOCOR DEVICES IN ROUTINE, COMMUNITY-BASED BLOOD PRESSURE ASSESSMENT

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Estimates of central blood pressure (BP) using the Vicorder have recently been validated in the catheter- and clinical-laboratory settings. The aim of the present study was to compare estimates of central BP obtained with the Vicorder and SphygmoCor, in a routine, community-based screening setting. Paired Vicorder and SphygmoCor measurements of central BP were available in 1032 individuals, age range 20-93 years. Brachial cuff BP was assessed using the Vicorder and central pressure derived from brachial cuff BP waveforms recorded with the same device. Brachial cuff pressure was also measured using an Omron 705CP and radial pressure waveforms recorded using the SphygmoCor. Both approaches used the respective brachial systolic and diastolic BP for peripheral waveform calibration, and the order in which Vicorder and SphygmoCor measurements were made was random.

Brachial cuff BP measured with the Vicorder and Omron devices were highly correlated (r=0.80, P<0.001, SBP; r=0.74, P<0.001, DBP) and in reasonable agreement, with a mean difference (±SD) between devices of 4±11 mmHg for SBP (P<0.001) and 5±7 mmHg for DBP (P<0.001). Similarly, estimates of cSBP were highly correlated (r=0.82, P<0.001) and in reasonable agreement (mean difference of 2±10 mmHg, P<0.001). In younger individuals, Vicorder-derived cSBP tended to underestimate SphygmoCor-derived values (Figure).

When used in routine practice, the Vicorder and SphygmoCor produce similar estimates of central systolic BP, although a greater disparity tended to be present in younger individuals. The ease of a cuff-based system for estimating central pressure is likely to be better suited to community-based screening programmes.

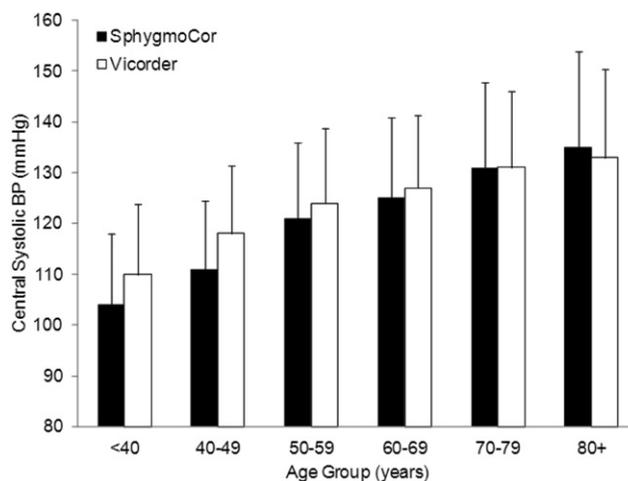


Figure Estimates of central systolic BP obtained with the Vicorder and SphygmoCor devices across the age range.