



Conference Abstract

P.41 Measurement of Pressure-dependent Intra-Beat Changes in Carotid Pulse Wave Velocity using Image-Free Fast Ultrasound

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Keywords

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ABSTRACT

Background: The clinical significance of pressure-dependent intra-beat changes in local pulse-wave velocity (C) has recently come to light [1]. While reported methods require arterial pressure and diameter measurements from a single site to assess intra-beat changes in C, we present an image-free fast ultrasound device that performs this by capturing diameter waveforms from two proximal locations on an artery.

Methods: The functionality was assessed on eight normotensive participants (26 ± 4 years). By perturbing blood pressure through a short duration moderate lower body negative pressure intervention [2], C_D and C_F pulse wave velocities corresponding to diastolic and 80% of peak pressure were measured from the carotid artery. Human NIBP system (ADInstruments, India) was used for monitoring continuous pressure.

Results: The device captured dual-diameter waveforms and evaluated C_D and C_F with a beat-to-beat variation $<8\%$ during baseline. C_D was smaller than C_F ($p < 0.001$), 4.2 ± 0.5 m/s versus 4.6 ± 0.7 m/s during baseline and 3.7 ± 0.6 m/s versus 3.9 ± 0.7 m/s during intervention. Concomitant to the drop in group-average diastolic (17%) and systolic (18%) pressures during the intervention, C_D and C_F dropped by 14% and 16%, respectively. The statistically significant correlation ($r > 0.6$, $p < 0.001$) of C_D and C_F with the diastolic and systolic pressures for each individual was preserved even after adjusting for heart-rate.

Conclusions: The device demonstrated its functionality and reliably measured the incremental nature of C. Its pressure-dependent intra-beat variations and inter-beat dynamics during the intervention concurred with literature. Further studies are underway to demonstrate the potential use of the device in vascular research and clinical applications.

REFERENCES

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