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Conference Abstract

P.40 Ambulatory Measurement of Carotid Stiffness with a Novel Accelerometric System

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Keywords

Cardiovascular disease
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ABSTRACT

Purpose: Arterial stiffness is a well-established marker for cardiovascular health assessment. Current methods rely on expensive imaging systems and specialised operators to perform local stiffness evaluation from the common carotid artery (CCA) and cannot be used for ambulatory monitoring in chronic disease management. In this study, we compare the performance of a novel accelerometric system, which performs ambulatory non-invasive CCA stiffness measurement, against an ultrasound-based stiffness monitor.

Methods: The accelerometric system with a wearable patch probe derives CCA's diameter parameters from the skin surface vibrations arising out of the arterial wall displacement wave propagated to the skin surface. A subject-specific one-time calibration procedure is used to ensure accuracy, reliability and repeatability. Inbuilt pressure measurement unit of the system estimates blood pressure at CCA. Simultaneously obtained pressure and diameter parameters are used to evaluate various clinically accepted stiffness indices. An *in-vivo* study was performed on 36 subjects (20–50 years). Measured stiffness indices were compared against those obtained sequentially from an imaging system analysed using Carotid Studio.

Results: Accelerometric-derived diameter waveform was comparable to that acquired using the reference device. Measured group-average end-diastolic diameter and distension values were 5.81 ± 0.53 mm and 0.51 ± 0.15 mm, respectively. Diameter and stiffness indices (β, Ep, AC, PWV, etc.) were repeatable over continuous cycles (variability <12%). These measures significantly correlated ($r^2 > 0.88$, $p < 0.001$) with an acceptable agreement. The one-time calibration remained valid for more than 12 days (error <13%).

Conclusion: The study demonstrated the feasibility and essential functionality of a cost-effective method for long-term stiffness monitoring with potential applications in ambulatory healthcare devices.

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