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FINAL PROGRAMME AND ABSTRACTS

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Development of a pulse wave velocity measurement system using computerized algorithm for the detection of characteristic points from pulse waves

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Objectives: Main concern for the development of a measurement and analysis system for the pulse wave velocity is to obtain pulse waves simultaneously from various sites of arteries, which could provide regional PWV values. Development of pulse sensors and feature extraction algorithm, and evaluation of the reproducibility experimentation are included for the study.

Methods and Results: Pulse wave velocity (PWV) measurement system which records ECG, PCC, and four pulse waves from carotid, radial, femoral and dorsalis pedis arteries, was developed. Pressure pulse sensors for pulse wave measurements were designed using resistive pressure sensors with gel-filled. Hardware including amplifier, filter, and isolation circuits for the detection of accurate signals was designed, and the intersecting tangent algorithm using least square mean (LSM) method was adapted for determining upstroke points. Regional PWV values, aorta, arm, and leg, were calculated automatically after the collecting ten seconds of data. To evaluate the reproducibility of a developed system, two analyses (within-observer and between-observer) were performed. Results were expressed in terms of mean difference ± 2SD, as described by Bland and Altman plots. Between-observer differences (mean ± SEM) for aorta, arm, and leg were 0.14 ± 0.15 m/s, 0.18 ± 0.10 m/s, and 0.07 ± 0.10 m/s, reproducibility coefficients (2SD) for aorta, arm, and leg were ±0.62 m/s, ±0.84 m/s, ±0.86 m/s, respectively, and the correlation coefficients were high especially 0.93 for aortic PWV. Within-observer differences (mean ± SEM) and reproducibility coefficients for aorta, arm, and leg were 0.01 ± 0.03 ~ 0.08 ± 0.04 m/s and ±0.20 ~ ±0.32 for observer A and B, respectively. All the measurements showed significantly high correlation coefficients ranges from 0.94 to 0.99 for both observer A and B.

Conclusions: Developed PWV measurement system provides accurate analysis results with high reproducibility. The most powerful feature of the system is that it provides the regional PWV values, aorta, arm, and leg, at the same time. The system utilized a precise algorithm for the detection of the important characteristics from the pulse waves, which leads to provide an accurate PWV values.