A New Software for Determining Changes in Arterial Diameter over Time

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Objectives: The purpose was to investigate the ability of a new software, developed by our group, to provide continuous measures of arterial diameter from recorded ultrasound video.

Methods: Software (MAUI) was developed to assess arterial diameter using active contours to accurately detect the vessel walls in recorded ultrasound video. Ultrasound imaging was used to acquire longitudinal, B-Mode images of the common carotid artery (CCA) with videos recorded for later analysis. A single recorded 10s video was used to gain an indication of the reproducibility and repeatability of MAUI. For this assessment, two investigators (E1 and E2) each performed 10 measurements of the test video using the MAUI software. MAUI was then used to process several longer videos (~5min) to assess the ability of the software to continuously process data over longer periods of time.

Results: MAUI provided a measurement of vessel diameter (media to media border) for each frame of the recorded video. The ten assessments of the test video resulted in average standard deviation of 0.002±0.003cm for E1 and 0.003±0.003cm for E2 for each frame measurement. Overall analysis of the test video resulted in an average diameter, measured across eight cardiac cycles, of 0.781±0.0005cm and 0.780±0.0007cm for E1 and E2 respectively. Measures by E1 and E2 ranged from 0.781 to 0.782cm and 0.779 to 0.781cm respectively. When processing the 5min videos, MAUI was able to continuously track the vessel walls throughout the entire video.

Conclusions: Preliminary assessments suggest that MAUI software represents a viable method for the continuous assessment of arterial diameter over time with high repeatability and low interrater variability. Use of this software may be especially applicable for studies investigating acute changes in vessel dimensions as well as the study of vascular properties in health and disease.

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