Estimations of Total Arterial Compliance from Carotid vs. Generalized Transfer Function-Derived Central Pressure Waveforms

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Background: Generalized transfer functions from radial pressure waveforms are often used to estimate the peak central aortic pressure. However, time-resolved information in the waveform can also be used to assess the total arterial compliance, using central pressure and flow waveforms. Although carotid waveforms are preferred over peripheral arterial waveforms, high quality carotid waveform recordings are difficult to obtain in multicenter studies.

Objectives: Total arterial compliance estimated using radial artery tonometry (using a generalized transfer function, GTF) strongly correlates with the results obtained with carotid tonometry.

Methods: We studied 212 adults (mean age = 62.8, % male = 84.5). Radial and carotid arterial waveforms were obtained with arterial tonometry (Sphygmocor device). A GTF was used to obtain a central pressure waveform from the radial pressure waveform. Aortic flow was assessed with phase-contrast MRI. Total arterial compliance was estimated using 3 methods: - (1) pulse pressure method (PPM) (2) area method (AM) (3) diastolic decay method (DDM, fitting an exponential decay to the diastolic waveform).

Results: Correlation coefficients between carotid and GTF-derived arterial compliance estimates were 0.92 for the PPM, R = 0.91 for the AM, and R=0.77 for the DDM. When comparing absolute values, estimates obtained with the PPM were significantly different when using carotid vs. radial/GFT-derived pressure waveform, with a systematic small positive bias when using radial waveforms. (Δ=0.152;P<0.001). In contrast, values obtained with carotid vs. radial waveforms did not show any significant differences with the DDM (Δ=0.035; P=NS) and AM (Δ=-0.0158; P=NS).

Conclusions: Total arterial compliance assessed with radial GFT-derived central pressure waveforms provide acceptable estimates, compared to those obtained with carotid pressure waveforms. The area method provides consistent results between the 2 sites, without significant systematic bias.