TACSM Abstract

An Assessment of the Potential for Standardizing Various Measures of Arterial Stiffness

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ABSTRACT

Arterial stiffness is an independent risk factor for cardiovascular disease. Different measures of arterial stiffness have been used to assess the impacts of exercise training interventions. One of the primary problems faced by investigators conducting systematic reviews and meta-analyses is the lack of standardized methodology to evaluate and compare efficacies of the existing and newly conducted exercise interventions on arterial stiffness. The reference standard measure of arterial stiffness is pulse wave velocity (PWV) while other commonly-used methodologies are ultrasound-derived arterial compliance and distensibility. **PURPOSE**: To describe standardized equations to convert common ultrasound-based measures of arterial stiffness (arterial compliance, distensibility, ß-stiffness index, elastic modulus) to local PWV. **METHODS**: We first conducted a literature search to derive conversion equations. For measures of arterial stiffness that conversion equations cannot be used, we generated regression equations using the accumulated dataset available in the laboratory. Subsequently, these equations were cross-validated in a well-controlled laboratory-based study, in which all measures of arterial stiffness were collected in 49 apparently healthy participants. **RESULTS** The literature search revealed that some measures of arterial stiffness such as distensibility coefficient (DC) can be converted to local PWV using the Bramwell-Hill model (PWV = $[\rho \cdot DC]^{1/2}$) with an assumption of ρ=1059 kg/m^3. Ultrasound-based measures of arterial stiffness were strongly and significantly associated with local PWV with Pearson r ranging from 0.74 to 0.99 ($p < 0.01$). Converted local PWV using regression models were correlated with each other (r=0.73 to 0.97, $p<0.01$). The correlations between converted local PWV and directly measured carotid-femoral PWV ranged from weak to moderate correlations with the range of r from 0.08 to 0.41. **CONCLUSION**: Our findings indicate that commonly-used measures of ultrasound-based arterial stiffness can be converted to local PWV and can be compared with a reference standard measure. These conversions can be used in systematic reviews and meta-analyses to synthesize evidence across studies to detect effects.