Comparison of an Oscillometric Method with Cardiac Magnetic Resonance for the Analysis of Aortic Pulse Wave Velocity

Feistritzer HJ[1], Reinstadler SJ[1], Klug G[1], Mayr A[2], Kremser C[2], Schocke M[2], Franz WM[1], Metzler B[1]

[1] University Clinic of Internal Medicine III, Cardiology and Angiology, Innsbruck Medical University, Austria
[2] University Clinic of Radiology, Innsbruck Medical University, Austria

Background

Pulse wave velocity (PWV) is the proposed gold-standard for the assessment of aortic elastic properties. The aim of this study was to compare aortic PWV determined by an oscillometric device and cardiac magnetic resonance imaging (CMR).

Methods

PWV was assessed in 41 healthy volunteers with two different methods. The oscillometric method (PWV_{OSC}) is based on a transfer function from the brachial pressure waves determined by oscillometric blood pressure measurements with a common cuff (Mobil-O-Graph, I.E.M. Stolberg, Germany).

CMR was applied to determine aortic PWV_{CMR} with the use of the transit-time method based on phase-contrast imaging on the level of the ascending and abdominal aorta on a clinical 1.5 Tesla scanner (Siemens, Erlangen, Germany). Pearson´s correlation coefficients, coefficients of variation and Bland-Altman plots were used to study methods agreement.

Conclusion

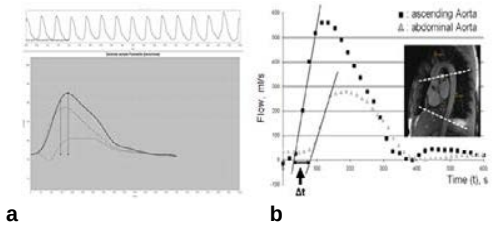

Figure 1: *Evaluation of aortic pulse wave velocity (PWV) using (a) a transfer function from brachial pressure wave analysis and (b) the CMR derived transit-time method based on phase-contrast imaging.*

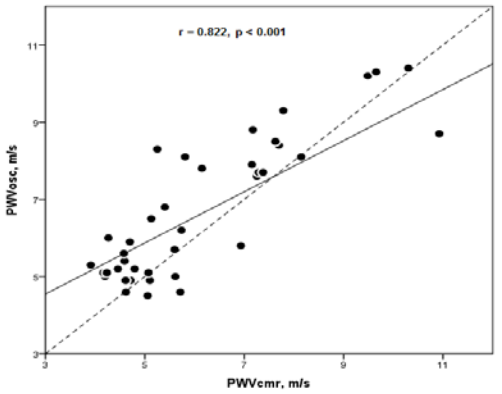

Figure 2: *Linear correlation of aortic pulse wave velocity (PWV) derived by an oscillometric method (PWV_{OSC}) and cardiac magnetic resonance (PWV_{CMR}).*

Results

Median age of the study population was 35 years (IQR: 24 - 56 years, 11 females). Both methods showed a very strong correlation with age (PWV_{OSC} r: 0.886 and PWV_{CMR} r: 0.837; p<0.001) as well as systolic and diastolic blood pressure (r: 0.355 - 0.705, p<0.025). Mean PWV_{OSC} was 6.73 ± 1.84 m/s and mean PWV_{CMR} was 6.30 ± 2.29 m/s.

A good agreement was found between PWV_{OSC} and PWV_{CMR} (r: 0.822, p<0.001) but the mean difference between both methods was 0.43 m/s (p = 0.039). The coefficient of variation between both measurements was 20%.

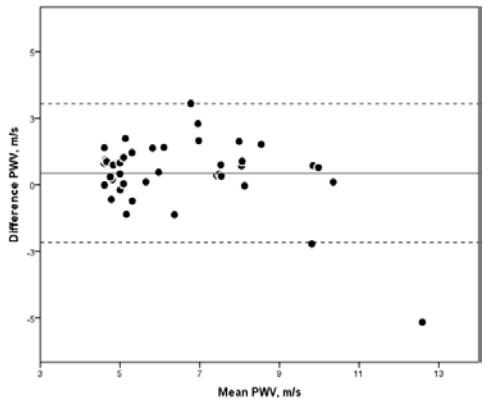

Figure 3: *Bland-Altman plot revealed a good agreement between the oscillometric method and cardiac magnetic resonance for the assessment of aortic pulse wave velocity (PWV) (coefficient of variation: 20%).*

Both methods showed a strong association with established determinants of PWV. We found a good agreement between PWV_{OSC} and PWV_{CMR}, but the measurements differed significantly in absolute values.