P50: VALIDATION OF ULTRASOUND DETERMINATION OF LOCAL PULSE WAVE VELOCITY IN THE HUMAN ASCENDING AORTA AGAINST MRI MEASUREMENTS

Madalina Negoita, Charlotte Manisty, Anish Bhuva, Alun Hughes, Kim Parker, Ashraf Khir


To link to this article: https://doi.org/10.1016/j.artres.2018.10.103

Published online: 7 December 2019
and geometric (diameter, ellipticity and curvature) parameters were investigated.

Results: Compared to HV, MFS presented larger aortic diameters only in the proximal Ao (p < 0.001) and DAo (p < 0.028). Increased ellipticity and a more distal location for the peak of aortic curvature were evident, even in the absence of dilation. Through most of the thoracic aorta, IRF was substantially lower in MFS, while SFRR was larger. Interestingly, non-dilated MFS had decreased IRF in the thoracic aorta compared to HV, although the absence of dilation. Through most of the thoracic aorta, IRF was sub-

Conclusions: MFS presented altered ellipticity and curvature distribution, which are related to abnormal flow patterns even in the absence of dilation.

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COMPARISON BETWEEN INVASIVE AND NON-INVASIVE METHODS: TO EVALUATE AORTIC STIFFNESS BY PULSE WAVE VELOCITY

Andrea Grillo 1, Francesco Moretti 2, Filippo Scalsie 3, Andrea Faini 4, Matteo Rovina 5, Lucia Salvi 6, Corrado Baldi 7, Giovanni Sorropago 8, Sandrine C, Millaisse 9, Renzo Carretta 10, Alberto P. Avolio 11, Paolo Salvi 12, Gianfranco Parati 9,4

1University of Milano-Bicocca, Milano, Italy
2University of Pavia, Pavia, Italy
3Polinciclinic di Monza, Monza, Italy
4IRCCS Istituto Auxologico Italiano, Milano, Italy
5University of Trieste, Trieste, Italy
6Pulse Wave Consulting, St Leu La Forest, France
7Macquarie University, Sydney, Australia
8Istituto Auxologico Italiano, Milano, Italy
9University of Milano-Bicocca, Milano, Italy

Objective: To investigate if invasively measured aortic pulse wave velocity (PWV) is accurately estimated by non-invasive methods purporting to assess it.

Methods: One-hundred and two patients (30% female, age 65 ± 13 years) planned to undertake coronary angiography were evaluated with the following non-invasive devices: BPLab (Petr Telogen, Russia), Compilor Analyse (Alam Medical, France), Mobil-O-Graph (IEM, Germany), pOpme`tre (Axe-life, France), PulsePen-ET, PulsePen-ETT (Diatecne, Italy) and SphygmoCor (AtCor, Australia). Aortic PWV was measured by aortic catheterization and simultaneous measurement of pressure waves above the aortic valve and at the aortic bifurcation (FS-Stiffcast, Flag Vascular, Italy).

Results: The devices evaluating carotid-femoral PWV showed a very strong agreement between each other (r² > 0.65) and with invasive aortic PWV (mean difference ± SD with invasive PWV: -0.73 ± 2.83 m/s (r² = 0.41) for Compilor-Analyse; 0.20 ± 2.54 m/s (r² = 0.51) for PulsePen-ETT; -0.04 ± 2.33 m/s (r² = 0.74) for PulsePen-ET; 0.61 ± 2.57 m/s (r² = 0.49) for SphygmoCor). The finger-toe PWV, evaluated by the pOpme`tre, and the PWV measured by BPLab showed a weak relationship with invasive PWV (respectively r² = 0.12, 0.05), with carotid-femoral PWV measurements (r² = 0.11, 0.010) and with age (r² = 0.10, 0.06). PWV estimated with Mobil-O-Graph through a proprietary algorithm showed a good agreement with invasive PWV (mean difference ± SD = -1.01 ± 2.54 m/s; r² = 0.51) and appeared to be strictly dependent on age-squared and peripheral systolic blood pressure (r² > 0.99).

Conclusions: Methods estimating carotid-femoral PWV should be considered the only non-invasive approach to reliably assess aortic stiffness. Aortic PWV estimated by Mobil-O-Graph algorithm are also significantly related to invasive PWV, but do not offer any additional information on top of what provided by age and systolic blood pressure levels.

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VALIDATION OF ULTRASOUND DETERMINATION OF LOCAL PULSE WAVE VELOCITY IN THE HUMAN ASCENDING AORTA AGAINST MRI MEASUREMENTS

Madalina Negoita 1, Charlotte Manisty 2, Anish Bhava 3, Alun Hughes 2, Kim Parker 2, Ashraf Khir 1

1Brunel Institute of Bioengineering, Brunel University London, UK
2Institute of Cardiovascular Science, University College London, UK
3Department of Bioengineering, Imperial College London, UK

Background: Pulse Wave Velocity (PWV) is a measure of arterial stiffness which predicts cardiovascular risk independently of blood pressure. Local PWV can be measured non-invasively in the ascending aorta of adults by ultrasound, using successive recordings of Diameter (D) and Velocity (V) [1].

Aim: To test US measurements of local PWV in the ascending aorta of human adults against MRI measurements of local PWV.

Methods: PWV in the ascending aorta of 8 healthy volunteers (age 22–34 years, 3 females) was measured using a Siemens MAGNETOM Aera 1.3T MRI scanner as per standard protocols with cine and phase contrast imaging (sampling frequency 100 samples/cardiac cycle) and D and U were calculated using validated software [2]. US images were recorded using GE Vivid E95 scanner with a 1.5–4.5 MHz phased array transducer. PLAX was used for diameter recordings and ASCH for velocity. Measurements were recorded for 20 s during a breath-hold. D and U waveforms were extracted from each imaging modality to calculate PWV using the ind(U)-loops technique [3].

Results: Average results are summarised in Table 1. The mean difference in PWV between MRI and US was 2.8 ± 0.3%.

Conclusions: PWV measured by US shows excellent agreement with MRI in the ascending aorta of adults. Given US availability, this technique offers an easy, affordable and non-invasive means of determining PWV and mechanical properties of the ascending aorta; thus, providing a tool for screening studies.

Table: Mean±SD (range) of augmentation index and reflection magnitude

<table>
<thead>
<tr>
<th>Method</th>
<th>Invasive</th>
<th>SphygmoCor</th>
<th>Mobil-O-Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augmentation</td>
<td>6.8±8.3</td>
<td>41.0±14.5</td>
<td>23.5±17.8</td>
</tr>
<tr>
<td>Index</td>
<td>(−17.4, 20.2)</td>
<td>(2.5, 82.0)</td>
<td>(0.9, 58.0)</td>
</tr>
<tr>
<td>Reflection</td>
<td>0.34±0.07</td>
<td>0.56±0.11</td>
<td>0.65±0.13</td>
</tr>
<tr>
<td>Magnitude</td>
<td>(0.22, 0.61)</td>
<td>(0.32, 0.94)</td>
<td>(0.05, 0.79)</td>
</tr>
</tbody>
</table>

P < 0.003 compared with Invasive
Table 1. MRI and US measurements of D, U and PWV. Data are means ± standard deviations (n=8).

<table>
<thead>
<tr>
<th></th>
<th>Min D (cm)</th>
<th>Max D (cm)</th>
<th>Min U (m/s)</th>
<th>Max U (m/s)</th>
<th>PWV (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI</td>
<td>2.5±0.4</td>
<td>3.0±0.3</td>
<td>0.1±0.0</td>
<td>0.9±0.2</td>
<td>3.5±0.8</td>
</tr>
<tr>
<td>US</td>
<td>2.4±0.2</td>
<td>2.8±0.2</td>
<td>0.3±0.1</td>
<td>1.1±0.2</td>
<td>3.6±1.0</td>
</tr>
</tbody>
</table>

References


PS5

NON-CONTACT MEASUREMENT OF LOCAL CAROTID AND CAROTID-FEMORAL PULSE WAVE VELOCITY BY LASER DOPPLER VIBROMETRY: VALIDATION OF A NEW DEVICE AGAINST REFERENCE TECHNIQUES IN HYPERTENSIVE PATIENTS

Louise Marais 1, Soren Aasmul 2, Roel Baets 3, Mirko De Melis 2, Stephen E. Greenwald 4, Hakim Khtetab 5, Yanlu Li 6, Frits Prinzen 1, Koen Reesink 7, Patrick Segers 8, Pierre Boutouyrie 9

1 PARCC, INSERM U797, Georges Pompidou European Hospital, Paris, France
2 Medtronic Bakken Research Center, Maastricht, the Netherlands
3 Photonics Research Group, INTEC, Ghent University, IMEC, Ghent, Belgium
4 Blizard Institute, Queen Mary University of London, London, UK
5 CARIM, Maastricht University Medical Center, Maastricht, the Netherlands
6 bioMMeda – Institute Biomedical Technology, Ghent University, Ghent, Belgium

Objective: PWV measurement devices are technically demanding, expensive and prone to artefacts, thus limiting the measurement of arterial stiffness in primary care. The CARDIS consortium developed a non-contact device based on the detection of skin movements induced by arterial pulses through a laser Doppler vibrometer (CARDIS-LDV). Our objective is to validate CARDIS-LDV against reference techniques.

Methods: This study sponsored by INSERM will include 100 essential hypertensive patients that it improves the screening of cardiovascular risk in large populations.

Conclusions: CARDIS-LDV is a promising technique to assess arterial stiffness; we expect to demonstrate its good agreement with reference techniques and that it improves the screening of cardiovascular risk in large populations.

References

