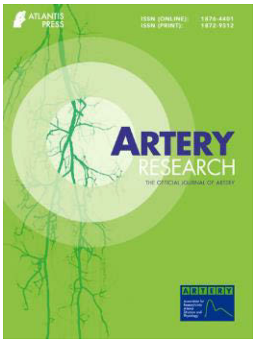

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P48: COMPARISON BETWEEN INVASIVE AND NON-INVASIVE METHODS: TO EVALUATE AORTIC STIFFNESS BY PULSE WAVE VELOCITY

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and geometric (diameter, ellipticity and curvature) parameters were investigated.
Results: Compared to HV, MFS presented larger aortic diameters only in the proximal AAo ($p < 0.001$) 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 SFRR was not increased. Statistically-significant bivariate relations were found between arch IRF and arch ellipticity ($R = -0.34$) and proximal DAo peak curvature ($R = -0.35$). Local diameter was negatively correlated with local IRF ($R = -0.3$) and positively correlated to local SFRR ($R = 0.605$).
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

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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 Telegin, Russia), Complior Analyse (Alam Medical, France), Mobil-O-Graph (IEM, Germany), pOpmètre (Axelife, 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-Stiffcath, 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 Complior-Analyse; 0.20 ± 2.54 m/s ($r2 = 0.51$) for PulsePen-ETT; -0.04 ± 2.33 m/s ($r2 = 0.61$) for PulsePen-ET; -0.61 ± 2.57 m/s ($r2 = 0.49$) for SphygmoCor). The finger-toe PWV, evaluated by the pOpmètre, and the PWV measured by BPLab showed a weak relationship with invasive PWV (respectively $r\ 2 = 0.12$, 0.05), with carotid-femoral PWV measurements ($r\ 2 = 0.11$, 0.010) and with age ($r\ 2 = 0.10$, 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 values 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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QUANTIFYING WAVE REFLECTION IN CHILDREN: INVASIVE VS NON-INVASIVE CENTRAL AUGMENTATION INDEX AND REFLECTION MAGNITUDE AND THEIR ASSOCIATION WITH LEFT VENTRICULAR MASS

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Objective: The aims of this study in children were to 1) evaluate two brachial oscillometric devices for estimating central augmentation index (AIx) and reflection magnitude (RM), and 2) test whether AIx or RM are associated with left ventricular mass index (LVMI).
Methods: Intra-aortic (IA) AIx was calculated from high-fidelity pressure measured with a Verrata wire (Philips Volcano) in 60 children (9.2 ± 4.7 years) with unobstructed aorta undergoing clinically-indicated catheterisation. AIx was also obtained from SphygmoCor XCEL (SC, AtCor) and/or Mobil-o-Graph (MB, IEM) brachial oscillometric devices. RM(IA) was calculated via wave separation using a representative normalised flow waveform obtained from MRI in a separate group of normal adolescents, RM(SC) via the triangulation method, and RM(MB) provided by the proprietary software. LVMI was estimated via echocardiography.
Results: Invasive vs non-invasive AIx and RM are compared in the Table. AIx(IA) correlated weakly with AIx(SC) ($R = 0.27$, $P = 0.04$) but not AIx(MB) ($P = 0.4$). Neither RM(SC) nor RM(MB) correlated with RM(IA) ($P = 0.13$ and $P = 0.96$ respectively). RM(IA) was moderately correlated with AIx(IA) ($R = 0.69$, $P < 0.001$) and weakly correlated with AIx(SC) ($R = 0.36$, $P = 0.007$) but not AIx(MB) ($P = 0.7$). In a multivariable regression, height ($P < 0.001$) and RM (IA) ($P = 0.04$) were independently and positively associated with LVMI (adjusted $R^2 = 0.24$), whereas there were no associations of any AIx or non-invasively estimated RM with LVMI.
Conclusion: Central AIx and RM were poorly estimated by SC and MB in children. Unlike RM(IA), none of the non-invasive indices of wave reflection correlated with LVMI, likely due to inadequate estimation of the central pressure waveform shape in this age group.

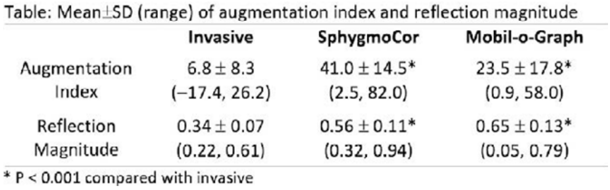
Table: Mean±SD (range) of augmentation index and reflection magnitude

	Invasive	SphygmoCor	Mobil-o-Graph
Augmentation Index	6.8 ± 8.3 (−17.4, 26.2)	41.0 ± 14.5* (2.5, 82.0)	23.5 ± 17.8* (0.9, 58.0)
Reflection Magnitude	0.34 ± 0.07 (0.22, 0.61)	0.56 ± 0.11* (0.32, 0.94)	0.65 ± 0.13* (0.05, 0.79)

* $P < 0.001$ compared with invasive

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

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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 means of Ultrasound (US), using successive recordings of Diameter (D) and the velocity (U) [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 y, 3 females) was measured using a Siemens MAGNETOM Aera 1.5T 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 A5CH 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 ln(D)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.