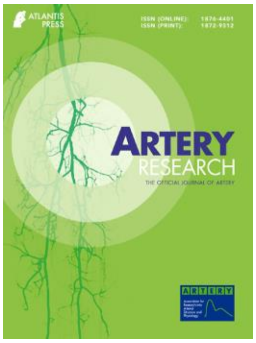

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P165: EVALUATING CAROTID FEMORAL PULSE WAVE VELOCITY MEASURED BY CUFF-BASED APPROACH AGAINST THE TONOMETRY-BASED REFERENCE STANDARD IN A PAEDIATRIC POPULATION

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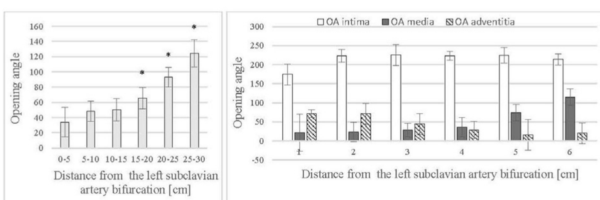
pressure. The aim of this work was to quantify regional variation of the layer-specific OA in the bovine descending thoracic aorta.
Methods: Descending thoracic aortae from 7 cows were segmented into 3—4 mm wide rings. Geometrical features (mean internal/external radius Rin and Rout, wall thickness h) were measured. A radial cut was made on the anterior region of each ring, and then the rings were placed in a temperature-controlled water bath (37 °C) for 1.5 h to express the OA. The rings were separated into their three layers and the layer-specific OA was investigated. The separation of the intima from the media is a complex procedure due to its limited thickness. The isolated intima was therefore thicker than values reported in the literature.
Results: Except for the most proximal region, h/Rin decreased towards the periphery (table 1). The medial and whole aortic wall OA increased moving towards the periphery, whilst the adventitia showed the opposite behaviour. The intimal OA was significantly higher and relatively constant (figure 1).
Conclusions: The present set of experiments indicates that the compressive residual stresses are concentrated mainly in the internal part of the intima-media layer independently from the considered axial region. The other layers exhibit comparable OAs to the whole arterial wall.

Distance	0-5	5-10	10-15	15-20	20-25	25-30
h/R_{in}	0.37	0.50	0.45	0.40	0.34	0.31



P164

INDICES TO ASSESS AORTIC STIFFNESS FROM THE FINGER PHOTOPLETHYSMOGRAM: IN SILICO AND IN VIVO TESTING

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Purpose: Aortic stiffness is predictive of cardiovascular morbidity and mortality. However, the gold standard method for assessing aortic stiffness, carotid-femoral pulse wave velocity, is time-consuming and requires a trained operator. An alternative approach could be to derive an arterial stiffness index (ASI) from the easily measured finger photoplethysmogram (PPG). Our aim was to investigate the performance of PPG-derived ASIs for assessing aortic stiffness.
Methods: An insilico dataset of arterial pulse waves (PWs) was generated using a model of pulse wave propagation (1). PWs were generated for virtual healthy subjects aged 25 to 75. Several simulations were run for each age decade to mimic population-level variation in cardiac and vascular properties. PPG PWs were simulated from blood pressure PWs (2). The dataset was used to design an algorithm to calculate over 30 ASIs described in the literature from the finger PPG. In vivo testing was performed using 6,506 subjects from the Airwave dataset (3) who had triplicate PPG and reference PWV measurements.
Results: In silico and in vivo performances of ASIs, including the stiffness index (SI) and reflection index, varied greatly. The SI performed well in vivo, showing strong correlation with reference PWVs. However, in silico assessment demonstrated that the SI and other ASIs were affected by other cardiac and vascular properties as well as aortic stiffness.
Conclusions: This study identified the best-performing ASIs in both in silico and in vivo datasets. In the future multiple ASIs should be combined to improve performance, since different ASIs have different physiological determinants.

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P165

EVALUATING CAROTID FEMORAL PULSE WAVE VELOCITY MEASURED BY CUFF-BASED APPROACH AGAINST THE TONOMETRY-BASED REFERENCE STANDARD IN A PAEDIATRIC POPULATION

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Background: Carotid femoral pulse wave velocity (cfPWV) is directly associated with arterial stiffness in major elastic arteries and predicts future cardiovascular events (1). Little is known of cfPWV as a marker of vascular health in children. Semi-automated cuff-based devices for assessing cfPWV are increasingly popular, although these utilize an algorithm developed and validated in adults (2). Physiological differences between adults and children may thus reduce the accuracy of cuff-based.
Methods: We sought to determine the accuracy of a cuff-based cfPWV device in healthy children and determine whether an age-appropriate algorithm increases accuracy. Methods we prospectively recruited 29 healthy children (mean age $= 11.5 \pm 5.2$ years old). cfPWV was measured using a tonometer on the carotid artery and an inflated cuff on the thigh (Sphygmocor XCEL; AtCor Medical, Australia), and using a tonometer on both the carotid artery and femoral artery (SphygmoCor CvMS; AtCor Medical, Australia) as a reference method. We assessed the accuracy of the cuff-based device with its standard algorithm that was developed in adults, and an adjusted algorithm corrected for physiological differences in leg (femoral to thigh cuff) PWV between adult and children (3).
Results: Cuff-based device estimates of cfPWV in children had excellent agreement to the reference standard ($r = 0.85$; $\Delta = -0.26$ ms^{-1} [SD 0.44]). The adjusted algorithm improved the accuracy of the cuff-based method ($r = 0.84$; $\Delta = 0.02$ ms^{-1} [SD 0.44]) (Figure 1).
Conclusions: Although the cuff-based semi-automatic approach estimates cfPWV with excellent agreement to the reference standard, adjusting the algorithm for known differences in leg PWV improves the accuracy of cuff-based measurement in children.

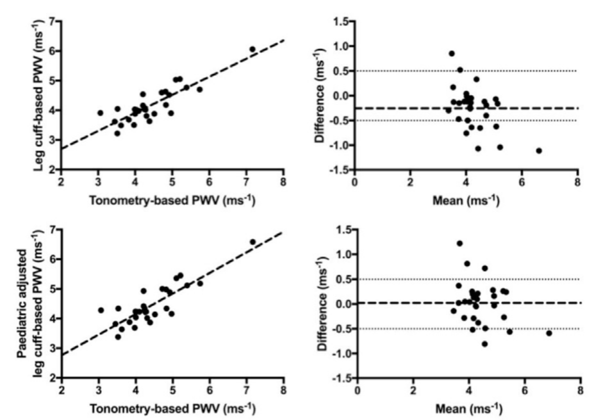

Figure 1. Bland-Altman analysis of a cuff-based pulse wave velocity device versus a reference tonometry-based pulse wave velocity device. Above – standard algorithm; Below – adjusted algorithm; Left – dashed line represents line of best fit; Right – dashed line represents the mean difference, dotted line represents ±0.5ms^{-1}

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