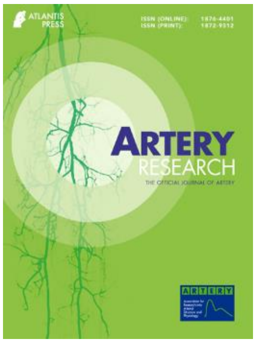

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P166: AORTIC PULSATILITY, AND NOT MEAN ARTERIAL PRESSURE, IS AN INDEPENDENT DETERMINANT OF LEFT MAIN CORONARY ARTERY DISEASE

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AORTIC PULSATILITY, AND NOT MEAN ARTERIAL PRESSURE, IS AN INDEPENDENT DETERMINANT OF LEFT MAIN CORONARY ARTERY DISEASE

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Introduction: Left Main Coronary Artery (LMCA) disease is prognostically the most important coronary lesion. LMCA differs from the other coronaries in having high elastin content. Aortic Pulsatility (AP) is an independent predictor of cardiovascular events in CAD. We hypothesized that pulsatile stress may be an independent determinant of disease in the LMCA.
Methods: This was a prospective cohort study in patients undergoing coronary angiography between the years 2011 and 2016 (n = 4633, 25% female) at King Abdul Aziz Cardiac Center, Riyadh, Saudi Arabia. We excluded patients with acute myocardial infarction, cardiogenic shock and significant valvular disease. Aortic systolic and diastolic blood pressures (BP) were measured in the ascending aorta. Mean Arterial Pressure (MAP) by direct integration of the BP curve and Pulse pressure (PP) as difference between systolic and diastolic BP. AP was calculated as PP/MAP. CAD was defined as $>$ 50% stenosis in any major vessel.
Results: Six percent of the population had LMCA disease (mean age 60 $\pm$ 11 years, 25% female). LMCA disease was associated with higher PP (69 $\pm$ 22 vs. 58 $\pm$ 18, $p < 0.0001$) despite similar MAP (94 $\pm$ 16 vs. 94.5 $\pm$ 14, p = 0.92) compared with non-LMCA disease. AP was significantly higher (0.72 $\pm$ 0.30) in LMCA disease compared with; 3-vd (0.63 $\pm$ 0.32); 2-vd (0.61 $\pm$ 0.28), 1-vd (0.58 $\pm$ 0.31) and non-obstructive CAD (0.52 $\pm$ 0.26) ($p < 0.0001$). In a stepwise regression model, AP was an independent predictor of LMCA disease (R^2=0.68, $P < 0.0001$) even when adjusted for potential confounders, including MAP, age and gender.
Conclusions: LMCA disease is independently associated with high AP. Considering aortic pulsatile stress to be an independent cardiovascular prognosticator, stiffness of the LMCA may play an important role in plaque formation, hitherto ignored.

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ACUTE EXERCISE EFFECTS ON VASCULAR AND AUTONOMIC FUNCTION IN PATIENTS WITH STABLE CORONARY ARTERY DISEASE

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Purpose: To examine the acute effect of maximal exercise effort on pulse wave velocity (PWV) and heart rate variability (HRV) in patients with CAD with a range of functional capacity levels, and the association between these parameters 1,2,3.
Methods: Thirty-six patients with CAD (62 $\pm$ 10 y) ranging in very-poor (5.22 $\pm$ 0.83METs; n = 18; VPFIT-CAD) to poor (6.50 $\pm$ 1.35METs; n = 18; PFIT-CAD) functional capacity, and 18 age-sex-matched healthy controls (8.53 $\pm$ 1.84METs; FFIT-CON) had their aortic- and peripheral-PWV, and HRV assessed prior to, and at 10 min and 30 min following a maximal cycle-ergometer test.
Results: Aortic- and peripheral-PWV did not differ between groups ($p > 0.05$) at baseline. Aortic-PWV was significantly increased at 10 min (0.63–0.98 $m.s^{-1}$) following exercise in all groups, but only remained so at 30 min in PFIT-CAD. Lower limb-PWV decreased in VPFIT-CAD and FFIT-CON at 10min (0.48; 0.51 $m.s^{-1}$) and remained so at 30 min (0.51; 0.45 $m.s^{-1}$), but not in PFIT-CAD. Still, no interaction effects were observed (p = 0.864). RMSSD was lower in PFIT-CAD compared to FFIT-CON (6.55, p = 0.009). RMSSD decreased at 10min following exercise in PFIT-CAD (5.26, p=0.005) and FFIT-CON (8.86, $p < 0.001$) but only remained so at 30min in PFIT-CAD (3.27, p = 0.47; p-interaction = 0.001). A significant correlation between changes in aortic-PWV and RMSSD assessed from prior to 10min recovery was observed in VPFIT-CAD (r = 0.44, p = 0.034).
Conclusion: Patients with CAD have similar arterial response to maximal exercise compared to their higher fit healthy peers. However, HRV following exercise is apparently compromised in CAD patients. The reduction in aortic PWV is parallel to the changes in HRV in patients with CAD with very-poor functional levels.

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FEASIBILITY STUDY OF LOCAL PULSE WAVE VELOCITY ESTIMATION IN THE CAROTID ARTERY WITH MULTI-BEAM LASER DOPPLER VIBROMETER

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Background: An innovative device using Laser Doppler Vibrometry (LDV) has been designed [1] to measure the transit time of the pulse wave between two locations along the course of the carotid artery (CA) from skin surface vibrations for assessment of local pulse wave velocity (PWV) [2].Aim: Tests were conducted on in-vitro models to assess the feasibility of the LDV to estimate the local PWV; preliminary in-vivo measurements were also performed.
Methods: Two CA geometries embedded within a soft-tissue-mimicking hydrogel were considered: i) a straight latex tube and ii) a patient-specific CA silicone-rubber model including the bifurcation. Models were pressurised in a water-filled loop and pulsatile flow was generated with a pump and/or high frequency impulses induced externally. For all measurements, two sets of six beams were used to measure surface displacement perpendicular to the external surface. PWV was calculated from the distance between selected beams and the delay between corresponding signals, using the time of the maximum of first and second derivatives of pressure (P-PWV) and displacement (LDV-PWV) as fiducial points [3]. A windowed cross correlation method [4] was also used for the in-vivo data analysis.
Results: PWV values for the in-vitro models are summarized in Table 1, while preliminary in-vivo LDV-PWV results are shown in Fig 1.
Conclusions: Good agreement between P-PWV and LDV-PWV in the tubular model was found under impulse loading, while complex waveforms measured under pulsatile flow and in-vivo conditions lead to more disparate effects when using different analysis methods. Further signal analysis is warranted.

	Straight tube model		Carotid model	
	Pulsatile flow	Induced impulse	Pulsatile flow	Induced impulse
P-PWV (m/s)	14.1	5.7	13.6	4.1
LDV-PWV (m/s)	3.2	6.2	5.1	15.7

Table 1. P-PWV and LDV-PWV mean values under pulsatile flow and induced impulse conditions.

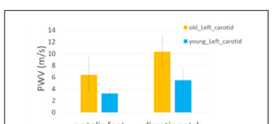

Fig 1 a) PWV mean values and standard deviation for a young (24 years) and old (72 years) subject, systolic foot and dicortic notch were used as reference points. Note the higher PWV in the older subject, as expected.

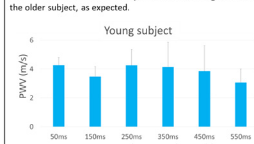

Fig 1 b) PWV mean values and standard deviation from windowed cross correlation analysis around the dicrotic notch region.

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