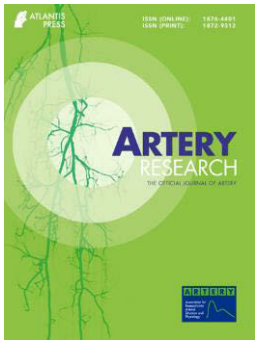

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3.7: PULSE WAVE VELOCITY IS AN INDEPENDENT RISK FACTOR FOR CARDIOVASCULAR EVENTS, MORTALITY AND DECLINE IN RENAL FUNCTION IN PATIENTS WITH TYPE 1 DIABETES

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Objectives: Accurate blood pressure (BP) measurement is critical for appropriate hypertension diagnosis and management. Aortic BP represents pressure loading on vital organs and this can be approximated using upper arm cuff BP. With advancing age, cuff systolic BP (SBP) increases and diastolic BP (DBP) decreases (widening pulse pressure [PP]), but whether age may influence cuff BP compared with invasive BP is unknown and was the aim of this study.
Methods: Cuff BP was measured simultaneously, or near-simultaneously, with invasive aortic BP during catheterization in 1696 individuals within the INSPECT consortium (an international collaboration comprising data from 31 studies and 19 different cuff BP devices [17 oscillometric, 2 mercury sphygmomanometry]). Differences in cuff and invasive BP were assessed using mixed models.
Results: Subjects were aged 63.3 ± 10.6 years and 32% female. Cuff SBP overestimated invasive aortic SBP in those aged 40–49, but with increasing age there was a progressive increase in the underestimation of aortic SBP (Table). Conversely, cuff DBP systematically overestimated aortic DBP, increasingly with age. Thus, there was a progressively higher error (underestimation) in cuff PP with older age. Adjusting models for sex, mean arterial pressure, heart rate and catheter type did not alter the findings, and no interactions between these parameters and age were found.
Conclusion: Cuff BP is progressively more biased with increasing age, exposing older people to greater chance for misdiagnosis of risk related to BP. The findings highlight the need to improve cuff BP methods to ensure all people receive appropriate diagnosis and management of hypertension.

Table.

Age category	n	Cuff – invasive systolic BP	Cuff – invasive diastolic BP	Cuff – invasive pulse pressure
40-49 years	170	3.5 [0.5 to 6.6]	4.5 [2.5 to 6.5]	-0.7 [-4.4 to 2.9]
50-59 years	406	0.9 [-1.2 to 2.9]	5.6 [3.7 to 7.4]	-4.6 [-7.2 to -2.1]
60-69 years	558	-0.6 [-3.4 to 2.2]	6.0 [4.1 to 8.0]	-6.7 [-9.6 to -3.9]
70-79 years	456	-3.3 [-5.5 to -1.1]	7.9 [5.6 to 10.2]	-11.0 [-14.2 to -7.9]
80-89 years	106	-4.5 [-8.8 to -0.3]	9.6 [5.9 to 13.2]	-13.8 [-19.2 to -8.5]

Data are mean [95% confidence interval]. BP, blood pressure.

3.6

BLOOD PRESSURE REDUCTION IS THE MAIN DETERMINANT OF THE DE-STIFFENING EFFECT OF ANTIHYPERTENSIVE TREATMENT: A META-REGRESSION ANALYSIS AND COMPARISON WITH ACUTE MODULATION OF TRANSMURAL PRESSURE

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Background: Pulse wave velocity (PWV) is independent predictor of cardiovascular outcomes. Antihypertensive treatment reduces PWV, but it is unknown whether this results from an unloading of stiffer elements in the arterial wall or a structural change in the wall.
Methods: To distinguish between these effects we performed a systematic review and meta-regression analysis of effects of different drug classes and durations of antihypertensive treatment on the relationship between reduction in PWV and that in mean arterial pressure (MAP). We compared this to the variation in PWV during an acute modulation of aortic transmural pressure (TMP) by respiratory manoeuvres, simulating a change in MAP in patients with essential hypertension.
Results: We identified 99 trials on 6,703 hypertensive individuals in total (average age and treatment duration were 56 ± 9.4 years and 21.6 ± 17.9 weeks, respectively). Reduction in PWV was strongly associated with that in MAP, PWV falling by 0.7 m/s per 10 mmHg fall in MAP (95% CI 0.5 − 0.86 m/s, $p < 0.001$). However, reduction in PWV was independent of drug class or duration of treatment. Change in PWV during respiratory manoeuvres was related to TMP with a similar relation to that observed in the meta-regression analysis: 0.94 m/s per 10 mmHg change in TMP (95% CI 0.34 − 1.54 m/s, $p<0.001$).
Conclusion: Antihypertensive treatment reduces PWV mainly by an unloading effect on the arterial wall, at least over the short term. There is little evidence for a treatment-specific effect. It may be possible to predict effects of antihypertensive treatment on reduction of PWV and pulse pressure by modulating transmural pressure.

3.7

PULSE WAVE VELOCITY IS AN INDEPENDENT RISK FACTOR FOR CARDIOVASCULAR EVENTS, MORTALITY AND DECLINE IN RENAL FUNCTION IN PATIENTS WITH TYPE 1 DIABETES

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Purpose: The prognostic significance of carotid-femoral pulse wave velocity (cfPWV) remains to be determined in patients with type 1 diabetes (T1D). We investigated the predictive value of cfPWV for various endpoints in T1D.
Methods: At baseline, cfPWV was measured using the SphygmoCor device in 652 patients with T1D and various degrees of albuminuria. Endpoints were traced through National Registers and patient records and comprised: composite CVE, mortality, progression in albuminuria, and decline in estimated glomerular filtration rate (eGFR) ≥30%. Median follow-up ranged from 5.2 to 6.2 years. Slope estimates of eGFR and urinary albumin creatinine rate (UACR) were calculated for a median of 5.5 years. Adjustment included sex, age, mean arterial pressure, LDL cholesterol, smoking, HbA1c, UACR and eGFR at baseline. Hazard ratios (HR) were calculated per 1 standard derivation (SD) increase in cfPWV.
Results: Of the 652 participants (56% male); mean±SD age was 54 ± 13 years and cfPWV 10.5 ± 3.38 m/s^2. After adjustment, higher cfPWV was significantly associated with all endpoints: composite CVE ($n = 81$; HR:1.31; $p = 0.045$); mortality ($n = 48$; HR:1.39; $p = 0.033$); progression in albuminuria ($n = 31$; HR:1.16; $p = 0.012$); and decline in eGFR ≥ 30% ($n = 90$; HR: 1.39; $p = 0.015$).Higher cfPWV was associated with a steeper decline in eGFR and a steeper increase in UACR after adjustments ($p \leq 0.009$).
Conclusions: In patients with T1D, higher arterial stiffness was consistently associated with a higher risk of CVE, mortality and decline in renal function, independent of other risk factors. Measurement of cfPWV may have a promising role in risk stratification in T1D.