Pulse Pressure Is the Best Predictor of Cardiovascular Mortality in 12,763 Middle-Aged Men of the Seven Countries Study: 25-Year Follow-Up

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BACKGROUND: Hypertension is a dominant characteristic in the prediction of cardiovascular disease (CVD). However, much attention has been given over the years to which blood pressure is the best measure for CVD events. The aim of this study was to evaluate the effect of pulse pressure on CVD mortality.

METHODS: Sixteen cohorts of total 12,763 men aged 49-59 in seven countries (one cohort was the USA, two in Finland, one in the Netherlands, three in Italy, two in Croatia (former Yugoslavia), three in Serbia (former Yugoslavia), two in Greece, two in Japan) were surveyed from 1958 to 1964. Risk factors and personal characteristics were measured and follow-up for vital status and causes of death were carried out over 25 years (1986). Analyses were based on comparisons of mean levels of risk factors and death rates within the 16 cohorts. RESULTS: The relation of pulse pressure and 25-year CVD mortality was strongly positive and significant in all cohorts (age adjusted hazard ratio (HR) varied among cohorts from 1.06 to 1.17 per 5 mm Hg, p < 0.05). Moreover, statistical analysis revealed that pulse pressure levels were the best predictor for CVD deaths among all blood pressure measurements. This trend was recognizable in normotensive, borderline and hypertensive men, where CVD mortality increased with the level of pulse pressure. Pulse pressure levels were also a significant predictor for coronary heart disease deaths (pooled HR per 5 mm Hg = 1.10, 95% CI 1.08 to 1.11) as well as stroke (pooled HR per 5 mm Hg = 1.13, 95% CI 1.10 to 1.17). There was a weak relationship between HR and systolic and diastolic blood pressure (r = 0.130, P<0.01), while there was no relationship with heart rate.

Conclusions: Systolic Reflective Index (SRI) derived from the systolic part of the radial pulse waveform analysis is a useful parameter in the non-invasive assessment of arterial stiffness, which is more influenced by small than large artery elasticity. Diastolic pulse contour analysis provides more insight by separate assessment of the large and small artery system, which causes the reflect wave to return during ventricular systole.

Microalbuminuria Predicts Coronary Microvascular Dysfunction in Hypertensive African Americans With Left Ventricular Hypertrophy

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Background: Microalbuminuria (MAL), defined as subclinical elevation of albumin in the urine between 30 to 300 mg/day, is a marker of endothelial dysfunction and, in population studies, has been shown to be an independent predictor of ischemic heart disease. MAL is postulated to occur because of increased microvascular permeability which is caused by circulating inflammatory cytokines or, alternatively, glomerular hypertension. Thus, MAL may be a useful cardiovascular biomarker. The purpose of our study was to examine the correlation between MAL and invasive measures of coronary microvascular function in hypertensive subjects with normal coronary arteries.

Methods: MAL was quantitatively measured in a spot urine collection obtained at the time of the pre-catheterization clinical evaluation. Normal urine albumin concentration is defined as <2 mg/ml and MAL as 2 to 20 mg/ml. Coronary endothelial function was measured using the Doppler Flowire, quantitative coronary angiography, and the endothelium-dependent and -independent agents, acetylcholine (ACH) and adenosine. The study examined 46 African American (AA) and white (W) hypertensive subjects of similar age, MAP, and BMI with left ventricular hypertrophy (LVH), defined as LV mass indexed by body surface area (BSA) >47 g/m² in women and >50 in men.

Results: MAL was present in 19 of 46 AA (41%) and in 14 of 58 W (24%). Both indexed LV mass and MAL were significantly greater in AA (70 ± 2.8 vs 63 ± 2.1 g/m², p = 0.067) and in men (83 ± 2.0 vs 73 ± 1.9 g/m², p = 0.001). MAL was inversely correlated with MAP among AA (p = 0.03, r = 0.55) but not among W subjects (p = 0.51, r = 0.19). Similarly, peak CBF response to adenosine was inversely correlated with MAL among AA (p = 0.015, r = 0.55), but not among W subjects (p = 0.22, r = 0.35). Finally, peak CBF response to adenosine, but not ACH, was inversely correlated with MAP among both AA (p = 0.03, r = 0.32) and W subjects (p = 0.01, r = 0.34). This appeared to be related, in part, to interaction between MAL and MAP.

Conclusion: We conclude that MAL, in combination with MAP, are useful noninvasive biomarkers for the prediction of coronary microvascular dysfunction, particularly among AA.