

U. Elewa, B. Fernandez-Fernandez, R. Alegre, I. Mahillo, J. Egido, A. Ortiz
Nephrology Division - Fundación Jiménez Díaz University Hospital, Madrid, Spain

Introduction

Hypertension and diabetes are age-associated conditions that are risk factors for both end-stage renal disease (ESRD) and vascular risk. Vascular stiffness is a marker of vascular injury that predicts cardiovascular outcomes. A correct understanding of the factors contributing to vascular stiffness will contribute to the implementation of preventive and therapeutic measures that improve patient outcomes.

Objectives

Define the predictors of vascular stiffness as assessed by pulse wave velocity in patients undergoing MAPA at a nephrology outpatient clinic.

Methods

A cross-sectional analysis of a prospective cohort of 122 individuals [86 males (70.5%), 36 females (29.5%), mean age 60.2 ± 12.8 years]; 107 CKD patients and 15 non-CKD. Diabetes was present in 80 (65.6%) patients and hypertension in 104 (85.2%). All study participants underwent clinic blood pressure measurement, 24-h ambulatory blood pressure monitoring, echo-cardiogram, Carotid-Femoral Pulse Wave Velocity (PWV) and Pulse Wave Analysis (PWA) (using SphygmoCor) and 40 laboratory parameters potentially related to cardiovascular risk were prospectively assessed. Subgrouping of the patients depending on CKD stage was 15 (12.3%) non-CKD, 6 (4.9%) stage 1, 56 (45.9%) stage 2, 28 (22.9%) stage 3A, 13 (10.7%) stage 3B, 4 (3.3%) stage 4 and 0 (0%) stage 5. Albuminuria <30 mg/g Cr was present in 45 patients (36.9%), 30-300 in 41 patients (33.6%), 300-1000 in 20 (16.4%) and >1000 in 16 patients (13.1%).

Results

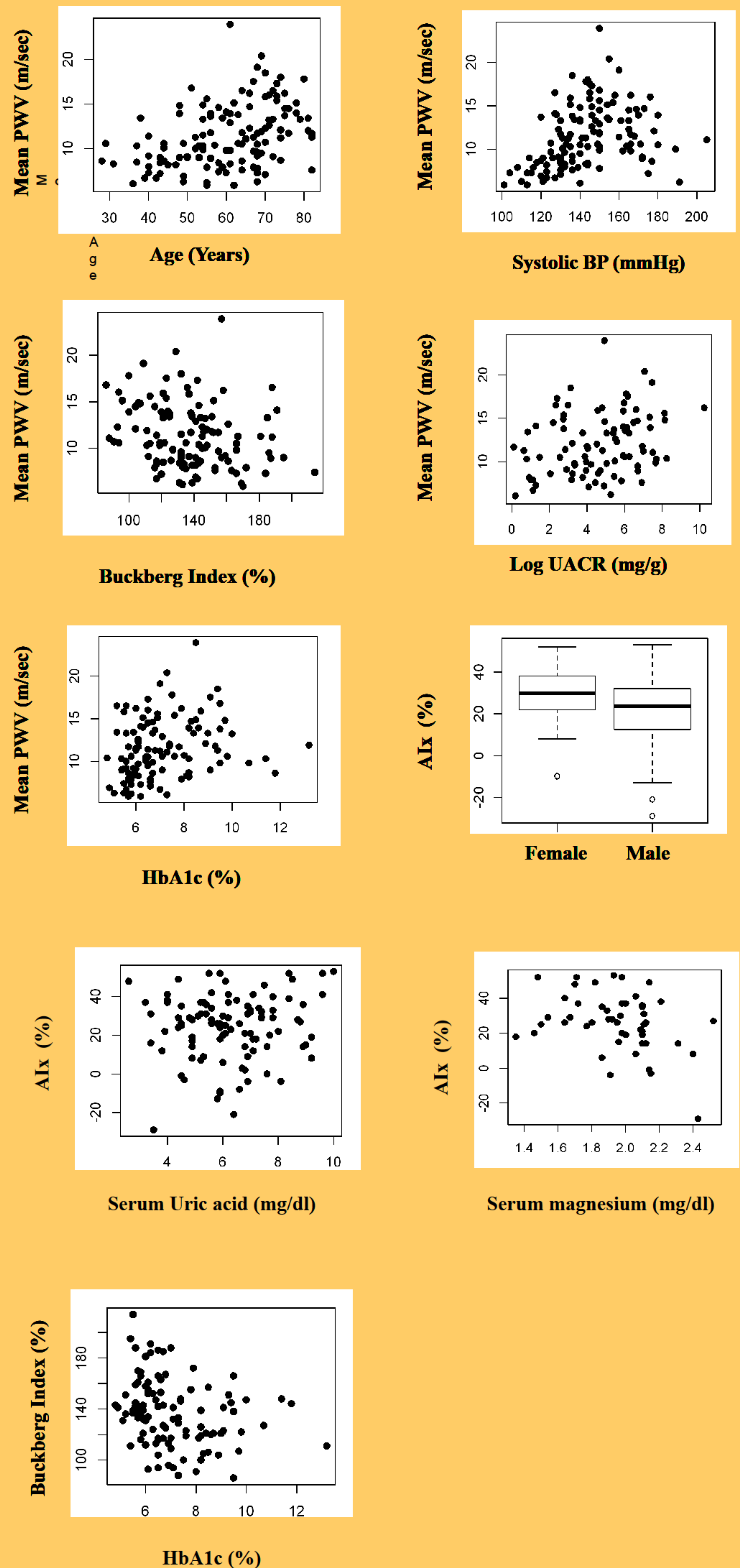
Mean Carotid Femoral PWV was 11.5±3.5 (m/sec). Higher than expected for age values were observed in 54 (44.3%) patients.

A univariate analysis showed that:

- Males had a higher 24 hours mean diastolic blood pressure (DBP) (p=0.005).
- Age was positively correlated with 24 hours mean pulse pressure (PP) (p=0.0004) and aortic augmentation index (AIx) (p=0.007).
- Diabetes was correlated with 24 mean systolic blood pressure (SBP) (p=0.0039) and mean PP (p=0.0000). Also diabetics showed lower Buckberg index (p=0.0058).
- Urinary albumin creatinine ratio (UACR) was positively correlated with 24 mean SBP (p=0.0005), mean arterial blood pressure (MAP) (p=0.0097), PP (p=0.0007) and AIx (p=0.01), while there was a negative trend with Buckberg index (p=0.17).
- Interventricular septum correlated positively with 24 hours mean SBP (p=0.0371) and PP (p=0.038). Altered left ventricular relaxation was positively correlated with high mean SBP (p=0.043), high PP (p=0.0428) and low DBP (p=0.008). Valvular calcification was correlated with low DBP (p=0.0004) and high PP (p=0.02). Left ventricular diameter was positively correlated with height (p=0.0042), while left ventricular hypertrophy positive correlated with mean SBP (p=0.052), and PP (p=0.0034).
- PWV was correlated positively with mean SBP (p=0.001), PP (p=0.001), and diabetes (p=0.0001) and negatively with Buckberg index (p=0.0059). Regarding the laboratory correlations; it was positively correlated with UACR, serum uric acid, and HbA1C (p=0.0078, 0.0158 and 0.0091) respectively and negatively correlated with eGFR (p=0.001). There was a trend towards a negative association with serum magnesium level (p=0.0912).
- AIx was higher among females (p=0.0044) and negatively correlated with hemoglobin (Hb) level (p=0.0483) and serum magnesium level (p=0.0137). While Buckberg index was lower among females (p=0.0005) and positively correlated with Hb (p=0.016) and negatively with HbA1C (p=0.0054).

A multivariate analysis showed:

- Independent predictors of abnormally high PWV were advanced age (p=0.0000), high SBP (p=0.002), high HbA1C (p=0.0249), high UACR (p=0.0213) and low Buckberg index (p=0.0531) with [r²=0.28].
- Independent predictors of abnormally high AIx were female gender (p=0.0001), serum magnesium (p=0.0001) and serum uric acid (p=0.0086) with [r²=0.36].
- Independent predictors of abnormally low Buckberg index was HbA1C (p=0.05) with [r²=0.18].



Conclusions

- Old age, high systolic blood pressure, high Proteinuria and bad glycemic control are predictors of increase cardiovascular risk in diabetic nephropathy patients.
- Carotid Femoral PWV and Buckberg index of the PWA are non invasive measures to predict the higher risk of vascular stiffness and hence the cardiovascular risk.
- PWV is much more accurate in detecting the vascular stiffness than Aortic augmentation index
- We recommend that blood pressure, blood glucose and other common cardiovascular risk factors are monitored regularly especially in high risk patients as CKD populations.

