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The prognostic significance of the blood pressure-pulse wave velocity association for cardiovascular outcomes and mortality in hemodialysis patients

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Introduction and purpose: Hemodialysis patients have premature arterial stiffness, and the relationship between pulse wave velocity (PWV) and blood pressure (BP) may be different than in other hypertensives. Previous studies showed that when BP decrease is accompanied by PWV decrease the survival is improved. The aim of this study is to examine the prognostic significance of BP sensitivity of PWV for major cardiovascular outcomes and all-cause mortality in hemodialysis patients.

Methods: This is a prospective cohort study including 242 hemodialysis patients [age, 62.6±14.2 years; female, 91 (37.6%); hemodialysis vintage, 41.53±43.46]. All subjects underwent 48-hour-ABPM with Mobil-O-Graph-NG and followed-up for 33.17±19.68 months. The within-individual MBP-PWV association (MBP, dependent and PWV independent variable) was evaluated using the beta-coefficient value from simple linear regression analysis for each patient. The primary end-point was first occurrence of all-cause death, non-fatal myocardial infarction or non-fatal stroke. Secondary end-points were: (i) all-cause mortality; (ii) cardiovascular mortality; (iii) a combination of cardiovascular events.

Results: Patients who experienced the primary end-point during follow-up had significantly lower beta-coefficient levels (primary end-point: 19.877±3.975 vs 18.483±3.550, p=0.008). Higher quartiles of beta-coefficients (indicating dependency of PWV on MBP) were associated with higher cumulative freedom from the primary end-point (50.8%, 60.0% and 80.3% for quartiles 1 to 4 respectively; logrank-p=0.001), higher overall survival (60.7%, 61.7%, 73.3%, 86.9%; logrank-p=0.002) and higher cardiovascular survival (78.7%, 75.0%, 81.7%, 91.8% for quartiles 1 to 4; logrank-p=0.044). The future risk for the primary end-point, all-cause and cardiovascular mortality and the combined end-point was progressively increasing for lower quartiles of beta-coefficients (HR for all-cause mortality 3.395; 95% CI: 1.524–7.563, p=0.003 for quartile 1 vs quartile 4). Age (OR: 1.046, 95% CI: 1.016–1.077 per year increase, p=0.003) and 48h heart rate (OR: 0.949, 95% CI: 0.916–0.982 per bpm increase, p=0.003) were independently associated with weaker relationship between 48h-MBP and 48h-PWV.

Conclusions: Lower within-individual MBP-PWV association, based on AMBP recordings, is associated with higher risk of death and cardiovascular events in hemodialysis. These findings support that BP-independent arterial stiffness may be the underlying factor for adverse outcomes in these individuals.