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Comparative Effectiveness of RAAS Inhibitors and Beta-Blockers on Cardiovascular Outcomes and Survival in Hemodialysis Patients: A Nationwide Cohort Study

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Objectives : The optimal antihypertensive strategy for patients undergoing maintenance hemodialysis remains unclear. This study aimed to evaluate the cardiovascular and survival outcomes associated with beta-blocker (BB) and renin-angiotensin-aldosterone system inhibitor (RAASi)-based regimens using a large, retrospective observational cohort of Korean hemodialysis patients.

Methods : We analyzed maintenance hemodialysis patients from the Korean National Periodic Hemodialysis Quality Assessment Program, categorized by treatment: BB monotherapy, RAASi monotherapy, BB+RAASi, or other agents (Others). Baseline clinical characteristics were balanced using inverse probability of treatment weighting. The primary outcome, major adverse cardiac and cerebrovascular events (MACCE), comprised a composite of nonfatal cardiovascular events (myocardial infarction, coronary revascularization, stroke, or heart failure hospitalization) and all-cause death. Weighted Cox regression models were used to calculate hazard ratios (HRs) and 95% confidence intervals (CIs).

Results : A total of 23,522 patients were included (median follow-up, 6.0 years), with 15,790 MACCE events (67.1%) recorded. Compared to the Others group, RAASi monotherapy was significantly associated with a reduced risk of MACCE (HR, 0.97; 95% CI, 0.95–0.99) and all-cause mortality (HR, 0.95; 95% CI, 0.92–0.97). Similarly, BB monotherapy demonstrated a survival benefit compared to the Others group (HR, 0.95; 95% CI, 0.93–0.98), although it was not significantly associated with a reduced risk of MACCE (HR, 1.00; 95% CI, 0.97–1.02). In direct comparisons using BB monotherapy as the reference, RAASi monotherapy did not show statistical significance for either outcome. Notably, the survival benefit of BB monotherapy was attenuated in patients without atrial fibrillation. Combination therapy (RAASi+BB) yielded no additional clinical benefit over monotherapy.

Conclusions : In Korean maintenance hemodialysis patients, RAASi monotherapy is associated with favorable cardiovascular and survival outcomes. However, combination therapy provides no incremental benefit, and the efficacy of BB monotherapy appears to vary depending on comorbidities, such as atrial fibrillation. These results highlight the necessity of individualized antihypertensive therapy in this population.