KSN SEOUL, KOREA 2023
April 27(Thu) - 30(Sun), 2023
Coex, Seoul, Korea

Abstract Type : Oral
Abstract Submission No. : 1435

Aerobic exercise capacity and kidney function decline in heart failure with preserved ejection fraction patients

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Objectives: Heart failure with preserved ejection fraction (HFpEF) is a common condition, accounting for half of all heart failure patients. Chronic kidney disease (CKD) is a complication frequently found in patients with HFpEF. The development of CKD among HFpEF patients results in poor prognosis. However, factors related with increased risk of kidney function decline are not well known.

Methods: A total of 424 HFpEF patients with preserved kidney function (estimated glomerular filtration rate>60 mL/min/1.73 m^2) were included for evaluation. Aerobic exercise function was assessed by the peak O_2 consumption (VO_{2peak}) values obtained through cardiopulmonary exercise test. Primary outcome was development of incident CKD, defined as two consecutive eGFR levels <60 ml/min per 1.73 m^2 separated by ≥90 days, during the follow up period.

Results: The mean age of the patients was 64.2 ± 10.6 years and 33.5% were male. Cardiac ejection fraction and eGFR at baseline were 67.0 ± 6.8 % and 87.5 ± 12.2 mL/min/1.73 m^2, respectively. During 1082.8 person-years of follow-up, overall incidence rate of CKD development was 85.0 per 1,000 person-years. When the patients were grouped in tertiles by VO_{2peak} levels, CKD incidence rate gradually increased in groups with lower VO_{2peak} levels. Multivariable Cox analyses with sequential adjustments revealed that 1-standard deviation increase in the VO_{2peak} level was significantly associated with a 33% lower risk of CKD development. The adjusted hazard ratio (95% confidence interval) of the lowest VO_{2peak} tertile was 3.07 (1.51-6.24) when compared to the highest VO_{2peak} tertile. Linear mixed-effects models showed that annual eGFR decline was more rapid in groups with lower VO_{2peak} levels.

Conclusions: Poor aerobic exercise capacity, represented by reduced VO_{2peak} levels obtained through cardiopulmonary exercise test, is closely related with a higher risk of CKD development among patients with HFpEF.

Table 1