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Association of phase angle with nutrition, mortality, major adverse cardiovascular events and sarcopenia in maintenance hemodialysis patients

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Objectives:

Nutrition has been consistently important in end stage renal disease patients. However, it is difficult to obtain adequate nutritional status while avoiding fluid overload, hyperphosphatemia and hyperkalemia in hemodialysis patients. In addition, there is no golden standard for diagnosing protein energy wasting (PEW) in maintenance hemodialysis patients. We studied the clinical significance of phase angle using bioelectrical impedance analysis (BIA), one of the PEW diagnostic tools, to predict various clinical outcomes in maintenance hemodialysis patients.

Methods:

We retrospectively enrolled patients who received hemodialysis for more than 3 months from 2016 to March 2019, excluding patients had active cancer, or died within 30 days, had no BIA data. We evaluated the factors related phase angle and the role of phase angle as predictors of all-cause mortality and major adverse cardiovascular events (MACE), sarcopenia.

Results: Of 191 patients, 63.4% were men, mean age was 64.2 ± 12.4 years, mean body mass index (BMI) was 23.8 ± 6.9 kg/m², and the most common underlying disease were hypertension and diabetes mellitus. Lower phase angle group (phase angle $\leq 4^\circ$) patients had older age, higher portion of women, malnourished, and history of coronary artery disease (CAD) than higher phase angle group (phase angle $>4^\circ$) patients. Phase was significantly related with nutritional parameters. During a median follow up of 16.7 months, 14.1% (n=27) patients experienced a MACE, 11.0% (n=21) patients died. In multivariate Cox analyses, lower phase angle, higher CRP level and history of CAD were significantly related with all-cause mortality even after adjustment for covariates. However, phase angle was not significantly associated with MACE and sarcopenia.

Conclusions: In maintenance hemodialysis patients, phase angle was significantly related to mortality as well as nutritional status, but MACE and sarcopenia were not.