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The importance of muscle mass for predicting intradialytic hypotension among patients undergoing maintenance hemodialysis

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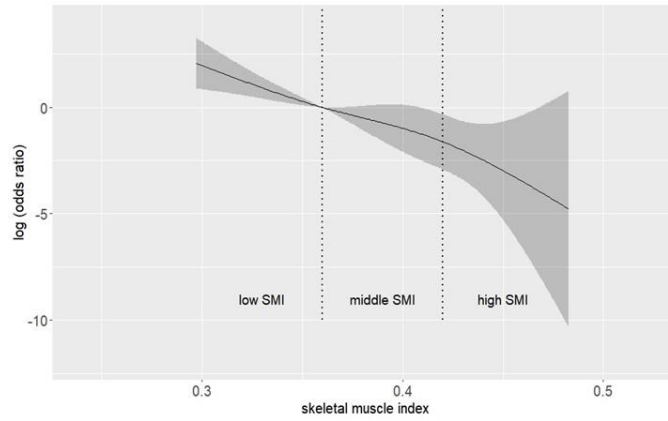
Objectives: Patients undergoing hemodialysis are susceptible to sarcopenia. This study was designed to determine the role of skeletal muscle mass in intradialytic hypotension.

Methods: 177 patients under maintenance hemodialysis were enrolled from four dialysis centers in 2016 and in 2020, and underwent bioelectrical impedance analysis just after hemodialysis. Patients were grouped into three groups by rank numbering in order of the percentage of skeletal muscle mass to dry body weight. The main outcome was intradialytic hypotension for the next three months after enrollment, defined as more than two episodes of hypotension (systolic blood pressure < 90 mmHg), requiring interventions. ROC curves to predict intradialytic hypotension were compared among multivariable logistic regression models including each parameters by bioelectrical impedance analysis. We compared three SMI groups using multivariable logistic regression models, and inverse probability of treatment weighting.

Results: Patients with a low skeletal muscle index (SMI) had a higher rate of intradialytic hypotension (41%). The low SMI group was female-dominant, more obese, more diabetic, and had lower handgrip strength than the other groups. In high SMI group, the risk of intradialytic hypotension was decreased (odds ratio [OR] = 0.08, [95% confidence interval (CI): 0.02–0.28]; adjusted OR = 0.06, [95% CI: 0.01–0.29]; OR, after inverse probability of treatment weighting = 0.71, [95% CI: 0.59–0.85]). When comparing AUC, models including skeletal muscle mass explained intradialytic hypotension better than model including clinical parameters only.

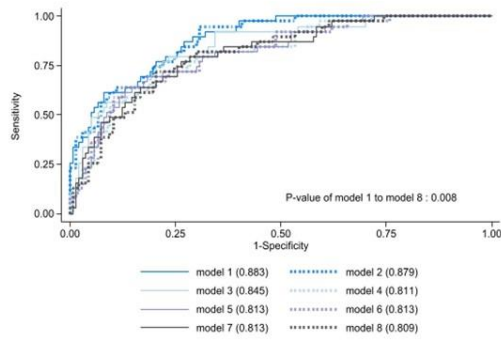
Conclusions: This study suggested that the measurement and maintenance of skeletal muscle would be helpful in preventing intradialytic hypotension in frail hemodialysis patients.

Figure 1. Restricted cubic spline curve of odds ratios according to the change of skeletal muscle index



Skeletal muscle index (SMI) was defined as the ratio of skeletal muscle mass (kg) to dry body weight (kg). Ranges of tertile group were depicted on this graph. Median of low SMI group was 0.336 (interquartile range (IQR) : 0.308–0.351), when that of middle SMI group was 0.389 (IQR : 0.373–0.405), and that of high SMI group was 0.446 (IQR : 0.431–0.471). SMI, skeletal muscle index.

Figure 2. ROC curves of multivariable logistic models including clinical parameters plus each parameter measured by bioelectrical impedance analysis



Models includes clinical parameters plus each parameter as follows: model 1, skeletal muscle index plus handgrip strength; model 2, skeletal muscle mass to dry body weight; model 3, skeletal muscle mass to squared height; model 4, extracellular water to total body water; model 5, intracellular water to total body water; model 6, phase angle at 50 kHz; model 7, handgrip strength; model 8, only clinical parameters. Clinical parameters included age, sex, cardiovascular comorbidities (chronic heart failure or ischemic heart disease), diabetes mellitus, cardiac index, and the percentage of ultrafiltration to body weight.