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Modified Charlson Comorbidity Index considering sarcopenia on mortality of patients with Acute Kidney Injury requiring Continuous Renal Replacement Therapy

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Objectives: Sarcopenia related to fracture and frailty has been recently classified as disease (ICD-10-CM code, M62.84), but conventional comorbidity indices did not consider the sarcopenia as a risk factor. Therefore, we aimed to develop a modified Charlson comorbidity index (CCI) with sarcopenia added (mCCI-sarcopenia) in patients with acute kidney injury requiring continuous renal replacement therapy (CRRT), thereby improving risk stratification for mortality.

Methods: We collected 2,205 AKI patients from 8 medical centers and measured skeletal muscle area (SMA) from CT images at the level of the 3rd lumbar vertebra. We set cut-off of SMA as 119.3cm^2 for male and 74.2cm^2 for female, which was suggested in previous research. Seven university hospital cohorts (n=1,063) were included to develop the comorbidity score and the mCCI-sarcopenia was computed by adding the weights of SMA to original CCI. The predictive capability of CCI and mCCI-sarcopenia for mortality was evaluated using c-statistics and continuous Net Reclassification Improvement (cNRI). The validity of the modified index was assessed in a university hospital cohort (n=1,142).

Results: The 30-day mortality rate was 52.6% (n=1,160) and 34.8% of the patients (n=733) had sarcopenia in total patients. In both cohorts, individuals without sarcopenia were observed to be younger and had a higher representation of males compared to those with sarcopenia. Significant differences of c statistics were found in comparison between CCI (0.54, 95% CI [0.51-0.58]) and mCCI-sarcopenia (0.56, 95% CI [0.54-0.60]) ($p < 0.01$). In addition, improved net mortality risk reclassification by 12.4 % (95% CI, 10.1– 23.8%; $p<0.01$) relative to the original CCI was found.

Conclusions: We suggest that sarcopenia, along with traditional comorbidities, be regarded as one of the essential diseases to assess the underlying risk of patients with severe AKI.