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Prognostic value of C-reactive protein/albumin ratio for cardiovascular morbidity and mortality in end-stage renal disease patients with incident haemodialysis therapy

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Background: Hypoalbuminemia, a manifestation of protein-energy wasting or malnutrition, is commonly observed in patients with end-stage renal disease (ESRD), and is associated with chronic inflammation and increasing cardiovascular (CV) risk. Recently, C-reactive protein (CRP)/albumin ratio at discharge is reportedly a well-predictor of mortality in severe sepsis or cancer patients.

We investigated prognostic value of the CRP/albumin ratio at just starting haemodialysis (HD) therapy for CV morbidity and mortality in patients with ESRD.

Methods: A total of 1,548 ESRD patients were enrolled and were divided into quartiles according to CRP/albumin levels at initiation of HD; quartile 1 (Q1): <0.22, Q2: 0.23–0.54, Q3: 0.55–1.83 and Q4: >1.84. They were followed up for 10-year after starting HD therapy. Primary endpoint was CV events defined as hospitalization due to CV events such as cardiac disease, stroke and peripheral artery disease and CV death. We also evaluated the incremental value with C-index when CRP alone, albumin alone and the CRP/albumin ratio were added into a model with established risk factors.

Results: During follow-up period (median: 59 months), 512 cases expe-

rienced CV events (33.1%) including 165 cases of CV deaths (10.7%). Kaplan-Meier analysis shows that CV event-free survival rates for 10 years were 63.5%, 53.8%, 47.5% and 31.9% in Q1, Q2, Q3 and Q4, and that CV survival rates were 90.4%, 83.9%, 77.2% and 64.6% in Q1, Q2, Q3 and Q4, respectively ($p < 0.0001$ in both). After adjustment for all baseline variables, elevated CRP/albumin ratio was identified as an independent predictor for CV events [hazard ratio (HR) 1.51, 95% confidence interval (CI) 1.11–2.07, $p = 0.0093$ for Q2 vs. Q1, HR 1.79, 95% CI 1.33–2.42, $p < 0.0001$ for Q3 vs. Q1 and HR 2.27, 95% CI 1.70–3.07, $p < 0.0001$ for Q4 vs. Q1, respectively]. As to CV mortality, similar results were obtained (HR 1.80, 95% CI 0.98–3.44, $p = 0.056$ for Q2 vs. Q1, HR 2.56, 95% CI 1.45–4.71, $p = 0.0009$ for Q3 vs. Q1 and HR 2.66, 95% CI 1.53–4.86, $p = 0.0004$ for Q4 vs. Q1, respectively). Furthermore, adding the CRP/albumin ratio to a baseline model with established risk factors improved the C-index greater than that of CRP alone or albumin alone, respectively (0.715 from 0.692, $p = 0.0095$ and from 0.683, $p = 0.0019$).

Conclusion: The CRP/albumin ratio, which easily available from daily practice, could strongly stratify the risk of future CV morbidity and mortality in ESRD patients who need HD therapy.