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Prognostic Value of the Charlson Comorbidity Index in Pulmonary Embolism

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We have read with interest the article by Ng et al. [1, in this issue of Respiration], which revealed that the Charlson comorbidity index (CCI) can predict outcomes following pulmonary embolism (PE). The authors expressed concern about the single-center nature of the study and the fact that the outcome data were obtained from a death registry. We wondered whether the results of the authors could be extrapolated to other patient groups. We have previously communicated the results of a prospective, single-center study that assessed the incidence of right ventricle dysfunction and pulmonary hypertension in 103 consecutive patients with a life expectancy of >6 months, who were diagnosed with hemodynamically stable PE by means of computed tomography pulmonary angiography [2]. The study was underpowered to assess short-term outcomes because of a low rate of in-hospital adverse events. However, we followed the long-term evolution of the patients after hospital discharge, and we found that neither residual vascular obstruction on the 6-month computed tomography pulmonary angiography [3] nor persistent echocardiographic signs or right ventricular pressure overload 6 months after the PE [4] predicted long-term adverse outcome events.

We retrospectively reviewed the patients included in the original study and calculated for each patient the non-age-adjusted CCI scores (na-CCI) at the time of diagnosis of PE, using the same methodology as Ng et al. [1]. We also calculated the age-adjusted CCI score (a-CCI) by adding one point to the score for each decade of live over the age of 50 [5]. Kaplan-Meier cumulative survival plots were obtained. The log-rank test was used to compare survival curves. The area under the receiver operating characteristic curve was used to calculate the c-statistic of the adjusted and unadjusted CCI scores. Differences in areas under the receiver operating characteristic curves were calculated using the method of DeLong et al. [6]. The present, retrospective study was approved by the review board of our institution.

Patients' characteristics and exclusion criteria have been reported elsewhere [2]. In summary, hemodynamically unstable PE, life expectancy <6 months, and creatinine clearance <35 ml/min were exclusion criteria. Mean age was 69 ± 15 years (median: 74

years, range: 29–92 years). Fifty-five percent of patients were male. Complete information on long-term evolution (median follow-up: 2.97 years) was obtained for 96 patients. Twelve patients died (median survival time from diagnosis: 771 days, range: 348–1,240 days). The median na-CCI score for the cohort was 0 (IQR: 0–1). Sixty-one patients had an na-CCI score of 0. Mortality for patients with an na-CCI score of 0 was 4.9 versus 25.7% for patients with na-CCI score ≥ 1 ($p = 0.0085$). The hazard ratio for patients with an na-CCI score ≥ 1 versus 0 was 5.22 (95% CI: 1.63–17.11; $p = 0.0055$). The median a-CCI score was 4 (IQR: 3–5). The c-statistic for na-CCI was 0.74 (95% CI: 0.64–0.83). The c-statistic for a-CCI was 0.77 (95% CI: 0.67–0.85). Areas under the receiver operating characteristic curves were not significantly different (difference: 0.025; 95% CI: –0.094 to 0.145; $p = 0.68$).

Although the present analysis is limited by its small size and retrospective nature, we think that it agrees with the findings of Ng et al. These results support the hypothesis that the CCI predicts long-term survival after PE, in a cohort with different characteristics from the one studied by Ng et al. Our patients did not suffer from the most severe form of PE, and both end-stage comorbidities and significant renal disease were excluded. Nonetheless, the CCI was still a predictor of mortality in this population. This finding supports the validity of the study by Ng et al., and we agree with the authors that future prospective studies should be performed before the index can be systematically incorporated into risk models to predict evolution after PE.

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