Hyperhomocysteinemia is an Independent Predictor of Contrast-induced Nephropathy in Patients Undergoing Percutaneous Coronary Intervention

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Background: Hyperhomocysteinemia induces oxidative stress and endothelial dysfunction, which are the proposed pathophysiologic mechanisms underlying contrast-induced nephropathy (CIN). However, no study has investigated the relationship between hyperhomocysteinemia and CIN. The aim of this study was to evaluate the effects of hyperhomocysteinemia on CIN in patients undergoing percutaneous coronary intervention (PCI).
Methods: This was an observational cohort study including 452 patients who underwent percutaneous coronary intervention (PCI). We excluded patients who had advanced renal impairment with an estimated glomerular filtration rate (eGFR) <30 ml/min/1.73m^2. Plasma homocysteine level was measured at the time of PCI. Patients were divided into quartiles based on their homocysteine level. CIN was defined as absolute ≥0.5 mg/dL or relative ≥25% increase in serum creatinine level within 48 hours after the procedure.
Results: CIN occurred in 30 of 452 (6.6%) patients. The incidence of CIN was significantly higher in patients in the fourth homocysteine quartile (0.9%, 1.8%, 8.9%, and 14.5%; p<0.001). Furthermore, homocysteine levels were significantly higher in patients with CIN than in those without CIN (17.0±4.9 vs. 13.6±4.1 μmol/L, p< 0.001). In multiple logistic regression models, hyperhomocysteinemia was an independent risk factor for CIN [per 1 μmol/L increase, adjusted Odds Ratio (OR)=1.21, 95% confidence interval (CI) 1.07-1.36, p=0.002) after adjusting for major risk factors such as age, diabetes, and baseline cardiac and renal function. In addition, diabetes (OR 4.17, 95% CI 1.29-13.44, p=0.017), hemoglobin level (per 1 g/dL increase, OR 0.61, 95% CI 0.41-0.91, p=0.016), eGFR level (per 1 ml/min/1.73m^2 increase, OR 0.97, 95% CI 0.94-1.00, p=0.026), and acute myocardial infarction (OR 4.03, 95% CI 1.20-13.51, p=0.024) were independent risk factors for the development of CIN. In subgroup analyses according to diabetes or baseline eGFR, there were also significant, graded associations between homocysteine level and the incidence of CIN.
Conclusion: We demonstrated that hyperhomocysteinemia is an independent risk factor for CIN in addition to the traditional risk factors including renal dysfunction, diabetes, and anemia. Our findings suggest that measurement of plasma homocysteine level may aid in the risk stratification of patients undergoing coronary intervention for the development of CIN.

Key Words: Homocysteine, Contrast, Acute kidney injury