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The prognostic value of serum magnesium levels in patients with heart failure with preserved left ventricular ejection fraction

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Background: In heart failure (HF) patients, various factors, such as hyperactivity of the renin-angiotensin system, influence of drug therapy such as loop and thiazide diuretics, undernutrition and others, can cause hypokalemia and hypomagnesemia. Although serum magnesium (Mg) levels are closely associated with the prognosis of HF patients, the clinical significance of serum Mg levels in cardiovascular outcomes of HF with preserved ejection fraction (HFpEF) patients is not fully understood.

Purpose: We examined the relationship between serum Mg and future HF-related events in patients with HFpEF.

Methods: This study was a retrospective, single-center, observational study. We enrolled 452 consecutive HFpEF patients admitted to our university hospital between January 2007 and September 2013 and followed them for 4 years or until occurrence of HF-related events. We defined lower serum Mg as < 2.0 mg/dL (=0.8 mmol/L) and higher serum Mg as ≥2.0 mg/dL based on recent clinical evidences and compared their clinical characteristics and prognosis.

Results: The mean serum Mg level was 2.12 mg/dL (median, 2.1 mg/dL; interquartile range, 2.0–2.28 mg/dL). The follow-up period was 0-50 months (median, 47.3 months) and 48 HF-related events (10.6%) were recorded. The frequency of HF-related events was significantly higher in the lower serum Mg group compared with the higher serum Mg group (n=16, 17.4% vs. n=32, 8.9%; P=0.018). There were no significant differences between groups in the use of all drugs (loop diuretics, mineralocorticoid receptor antagonists, renin-angiotensin-aldosterone system inhibitors, calcium channel blockers, β-blockers, statins and Mg preparations). The lower serum Mg group (n=92) showed significantly higher prevalence of diabetes mellitus (DM), uric acid levels and B-type natriuretic peptide (BNP) levels compared with the higher serum Mg group (n=360). Kaplan-Meier curve revealed a significantly higher probability of HF-related events in the lower serum Mg group compared with the higher serum Mg group (log-rank test, P=0.012, Figure). Multivariate Cox proportional hazard analysis revealed that the lower serum Mg group had significantly and independently higher probabilities of HF-related events compared with those in the higher serum Mg group (hazard ratio: 2.37, 95% confidence intervals: 1.27–4.41, P=0.007). We reclassified the risk of a HF-related event after adding the lower serum Mg to the prognostic factors (age, previous hospitalization for HF, DM, ln-BNP); the continuous net reclassification improvement was 29.0% (p = 0.041).

Conclusion: We first demonstrated that serum Mg was significantly correlated with the occurrence of future HF-related events in HFpEF patients. Lower serum Mg is able to successfully predict future HF-related events, and management of serum Mg in HFpEF patients is thus important.
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Figure
Kaplan-Meier analysis for the probability of heart failure (HF) related events in HF patients with preserved left ventricular ejection fraction according to serum magnesium (sMg) levels.