Prognostic significance of cardiac 123I-MIBG SPECT imaging in patients with acute decompensated heart failure with preserved left ventricular ejection fraction

M. Seo, T. Yamada, T. Watanabe, T. Morita, Y. Furukawa, S. Tamaki, M. Kawasaki, A. Kikuchi, T. Kawai, M. Fukunami

Osaka General Medical Center, Cardiology, Osaka, Japan
Funding Acknowledgement: Type of funding source: None

Background: Cardiac sympathetic nerve dysfunction, which is assessed by I-123 metaiodobenzylguanidine (MIBG) imaging, is associated with the poor outcomes in patients with heart failure (HF). Most of the literature on the use of 123I-MIBG imaging is based on planar images in patients with chronic HF and reduced left ventricular ejection fraction (HFrEF), because It is technically challenging to conduct precise 123I-MIBG SPECT analysis in globally denervated heart, which is frequently observed in HFrEF patients. There was no information available on cardiac sympathetic nerve dysfunction evaluated by cardiac MIBG SPECT imaging in acute decompensated HF (ADHF) patients with preserved left ventricular ejection fraction (HFpEF).

Purpose: We aimed to clarify the prognostic significance of 123I-MIBG SPECT myocardial imaging in ADHF patients with HFpEF.

Methods: We enrolled 183 patients who were admitted for ADHF with HFpEF, discharged with survival. All patients underwent cardiac MIBG imaging at the timing of discharge. The cardiac MIBG heart to mediastinum ratio (H/M) was calculated on the early image and the delayed image (late H/M). We studied 156 patients after excluding 27 patients whose MIBG SPECT reconstruction was difficult due to too low MIBG uptake or extracardiac accumulation interference. SPECT analysis on the delayed image was conducted by using CardioBull, a fully automated software for the quantification of I-123 MIBG SPECT. All of 17 regional tracer uptake were compared with normal control database. A scoring algorithm for the evaluation of low uptake employs a 5-point scoring system as 0–4 for normal, mildly abnormal, moderately abnormal, severe abnormal, and perfusion defect, respectively. The summed severity (SSS) scores were obtained by summing the score for all segments. SSS could range from 0 to 68. The endpoint of this study is cardiac events defined as the composite of unplanned heart failure hospitalization and cardiac death.

Results: During a mean follow up period of 2.4±1.6 years, 60 patients reached cardiac events. SSS was significantly high in patients with than without cardiac events (20 [10–27] vs 7 [4–16], $p<0.0001$). SSS ($p<0.0001$) was significantly associated with cardiac events after multivariable Cox adjustment of age, sex, creatinine and log-transformed BNP level, although late H/M showed the significant association with the endpoint at the univariate Cox analysis. Kaplan-Meier analysis showed that patients with high SSS (>10, defined by median) had significantly greater risk of cardiac event (56% vs 21%, Hazard ratio: 3.56 (2.00–6.33, $p<0.0001$). ROC curve analysis showed that area under the curve (AUC) of SSS was 0.746 [95% CI:0.670, 0.812], which was significantly higher than that of late H/M (0.618 [95% CI:0.537, 0.695]) ($p=0.0159$).

Conclusion: Cardiac MIBG SPECT imaging was useful for risk stratification in ADHF patients with HFpEF.