学 位 論 文 の 要 旨

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学　位　論　文　名　Factors Influencing Left Atrial Volume in Treated Hypertension

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論 文 内 容 の 要 旨

INTRODUCTION

Left atrial (LA) enlargement often occurs in patients with hypertension (HT). The increase in LA size and function occur in parallel with the degree of LV diastolic dysfunction. The occurrence of paroxysmal atrial fibrillation (PAF) in HT subjects is associated with LA enlargement, and the risk of developing AF is increased by 1.5 times in HT patients. The Framingham study revealed that a 5mm increase in left atrial dimension produced a 39% increase in the incidence of AF. AF is a major risk factor for stroke and mortality. Therefore, it is crucial to identify patients who have PAF in order to prevent subsequent thromboembolic complications, especially in patients with HT. It is of importance to assess the factors which affect LA volumes and the risk of AF in patients with treated HT.

MATERIALS AND METHODS

Subjects consisted of 873 HT patients from admission and clinic in the Cardiology Department of Shimane University Hospital. Patients with significant valvular diseases (more than mild valvular regurgitation or stenosis), myocardial infarction, left ventricular (LV) ejection fraction (EF) of <50%, and a history of AF, previous cardiac surgery, or implanted devices and uncompleted data were excluded. The final HT population analyzed consisted of 130 patients with sinus rhythm and well-controlled blood pressure (BP) (<140/90 mmHg), Mean age was 69.6 ± 10.1 years old, and females were 51 (39.2%). BP, echocardiographic examination including LA volume (LAV) measurements, and electrocardiogram and/or ambulatory electrocardiographic recording, routine blood samples including brain natriuretic peptide (BNP) were performed.

RESULTS AND DISCUSSION

In our study, 80% of the population was on ≤3 antihypertensive medications, and their BP was well-controlled (systolic BP, 135.2 ± 18.5 mmHg, diastolic BP, 73.9 ± 13.2 mmHg). LA enlargement was found in 83% in our study, 55.4% of all was severe LA enlargement ($\geq$40ml/m^2).

By univariate analysis, a positive correlation was noted between LAV and LVESV (r = 0.340), LV end-diastolic volume (LVEDV) (r = 0.480), LV mass (LVM) (r = 0.513), right ventricular systolic pressure (RVSP) (r = 0.372), inter-ventricular septal thickness (r = 0.230), LV end diastolic diameter (r = 0.351) and LV end-systolic diameter (r = 0.303) (p < 0.0001, in all). Neither BP, nor the use of antihypertensive medications influenced LAV. The geometry pattern of LV (relative wall thickness) didn't associate with LA size. When the univariate predictors were entered into a multivariate analysis, the only independent correlates of increased LAV included LVM indexed to height$^{2.7}$ (p < 0.0001), LVEDV (p < 0.0001) and RVSP (p < 0.0001). Using a best-fit model, LAV index = 0.628 + 0.246LVEDV + 0.235 LVM/H$^{2.7}$ +

0.410RVSP (adjusted r^2 = 0.407). In our study, we demonstrated that normal aging does not result in a significant increase in LAV. HT results in an increase in overall LAV due to further reduction in LV diastolic function due to HT over and above normal age-related changes.

RVSP based on the estimated flow of the tricuspid regurgitation jet had been established as a surrogate for the pulmonary artery systolic pressure. Regardless of LVEF, elevation in LV filling pressure leads to passive pulmonary venous congestion and postcapillary pulmonary hypertension. LAV is a barometer of LV filling pressure and reflects the burden of diastolic dysfunction. This may explain why RVSP had a correlation with LAV.

In the present study, the use of antihypertensive medications had no influenced on LAV. Well-controlled BP itself may be essentially more important for reducing LAV. In subgroups of LAV index according to quartile (1, <32; 2, 32~41; 3, 41~51; 4, ≥51 ml/m^2), 4.5% in group 1 had atrial arrhythmias, but no PAF. In group 2, there were 22.5% of atrial arrhythmias, of which 7.5% were PAF; there were 28.6% and 27.3% of atrial arrhythmias in group 3 and 4, respectively. The incidence of PAF was 11.4% and 15.2% in group 3 and 4, respectively. Increased LAV is associated with the increased occurrence of AF, especially LAV index ≥41 ml/m^2. In the liner regression, BNP levels had a significant positive correlation with LAV (r = 0.480, p **<** 0.0001), In HT patients, BNP may be regarded as a biomarker for LA enlargement or elevated LA pressure.

CONCLUSION

In patients with treated HT, LV end-diastolic volume and LVM may be pivotal for increased LAV. The incidence of PAF is associated with increased LAV. LAV may be a useful surrogate marker for monitoring the effectiveness of medical therapy and occurrence of AF.