Right atrial fibrosis quantified using voltage mapping is associated with sinus node dysfunction in patients with Non-paroxysmal atrial fibrillation

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Introduction: Although sinus node dysfunction (SND) coexists with atrial fibrillation (AF) in some cases, SND in patients with Non-paroxysmal AF (Non-PAF) could not be estimated in conventional electrophysiological study. Atrial low voltage zone (LVZ), which may be surrogate for atrial fibrosis, is although reported to present in patients with Non-PAF, the association between SND and right atrial LVZ (RA-LVZ) has not been fully evaluated. The aim of the present study was to assess the relationship between SND and RA-LVZ in patients with Non-PAF.

Methods: Eighty-six Non-PAF patients underwent high density voltage mapping of right atrium (RA) during AF before ablation procedure. We defined LVZ as that with electrogram amplitude < 0.1 mV in order to delineate strongly damaged area in RA. We evaluated the surface area of the RA-LVZ in Non-PAF patients with and without SND.

Result: Twenty-seven of 86 patients (31.4%) presented with SND after AF termination. There were no significant differences between patients with and without SND in variables such as age, sex, AF duration, left atrial diameter, and left ventricular ejection fraction. The mean value of RA-LVZ of all the patients was 12.1 ± 11.4%, and RA-LVZ was significantly larger in patients with SND than in those without SND (22.8 ± 14.6 vs 7.2 ± 4.2%; P < 0.001). In multivariate logistic regression analysis for the incidence of subsequent pacemaker implantation (PMI), only RA-LVZ was a significant predictor of subsequent PMI (odd ratio 1.306; 95% confidence interval 1.159 - 1.473; P < 0.001). Receiving-operating characteristic curve for PMI following ablation procedure indicated cut-off value 10.5% for RA-LVZ with 85.2% sensitivity and 88.1% specificity (area under curve = 0.924, P < 0.001). Kaplan-Meier analysis of the incidence of PMI after AF termination showed that freedom from pacemaker implantation was significantly better in patients with RA-LVA < 10.5% than in those with RA-LVZ ≥ 10.5% (log-rank test; P < 0.001).

Conclusion: Broad RA-LVZ measured during AF was strongly associated with SND and PMI after AF termination in patients with Non-PAF. Evaluation of RA-LVZ during AF could be a potential target in predicting SND requiring PMI in patients with Non-PAF.