Short coupling with high burden of atrial ectopy in twenty-four hour holter recording predicts recurrence of atrial arrhythmia after atrial fibrillation ablation

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Background: Atrial arrhythmia recurrence is experienced in up to 20% of patients after initially receiving a catheter ablation for atrial fibrillation (AF). Therefore, it is important to define predictors of atrial arrhythmia recurrence. Atrial ectopy (AE) with short coupling interval (S-AE) has been reported to be a trigger of AF. On the other hand, high burden of AE has been reported to be a useful predictor of atrial arrhythmia recurrences after AF ablation. Thus, the combination of the incidence of S-AE and AE burden during a 24-hour Holter recording could be a useful predictor of atrial arrhythmia recurrence after AF ablation.

Purpose: To investigate this hypothesis, we performed a retrospective case-controlled study.

Methods: We enrolled 180 patients who underwent their first catheter ablation procedure for AF and performed a 24-hour Holter recording between 90 to 365 days after their ablation procedure. Patients who performed an additional ablation procedure before the Holter recording were excluded. Finally, we analyzed 173 patients (age: 65±10 years, female: 28.3%, non-paroxysmal: 27.7%). The Holter recordings were analyzed by the same experienced technicians. We defined AE as a narrow QRS complex occurring >25% than prior R-R interval, and S-AE as AE occurring >55% earlier than expected. The relationship between the characteristics of AE during the Holter recording and atrial arrhythmia recurrences was investigated.

Results: The Holter recordings were performed at a median of 103 (IQR: 98–138) days after ablation. The median number of AE were 144 (IQR: 54–699) beats per day, and S-AE was recorded in 49 patients (28.3%). Forty-two patients (24.3%) had a recurrence of atrial arrhythmia during a median 488-day follow up period. Patients with S-AE had a recurrence of atrial arrhythmia more frequently than those without S-AE (44.9% vs 16.1%, $p<0.001$). We found the cut-off point of AE burden as 241 beats per day by the receiver operating characteristic curve with 74% sensitivity and 70% specificity to predict atrial arrhythmia recurrence. We divided the patients into four groups according to the presence or absence of S-AE and high AE burden. In the Kaplan-Meier analysis, patients with S-AE and high AE burden had the highest atrial arrhythmia recurrence rate (Log-rank test: $p<0.001$). In the Cox multivariate analysis, S-AE with high AE burden was an independent predictor of atrial arrhythmia recurrence (HR: 4.27, 95% CI: 2.32–7.85, $p<0.001$).

Conclusion: For AF patients who underwent their first catheter ablation, S-AE (>55% earlier than expected) with high AE burden (>241 beats per day) during the 24-hour Holter recording predicted recurrences of atrial arrhythmia. These results can help to develop follow-up strategies after AF ablation.