Introduction: It has been reported that the recurrence of atrial fibrillation (AF) after the initial catheter ablation (CA) procedure was caused by the reconnection of pulmonary vein (PV), presence of non-PV foci and progression of left atrial remodeling. However, it has not been fully clarified if there was a difference in the mechanism of early and late recurrent AF after initial CA for AF. The purpose of this study was to investigate whether or not there was a difference in the mechanism of recurrent atrial fibrillation (AF) between the early and late phase recurrent cases after catheter ablation (CA). Furthermore, we investigated if this difference is related to the subsequent clinical outcome after the repeated ablation procedure.

Methods: The consecutive 183 patients (paroxysmal; n=120, persistent; n=63) who underwent CA for recurrent AF were included in this study. CA of AF was performed in a stepwise fashion using an AF termination as a procedural endpoint (pulmonary vein (PV) isolation, roof line/complex fractionated atrial electrogram ablation and non-PV foci ablation) at the initial and repeated ablation sessions. During the repeated session, we investigated the mechanism of the recurrent AF and compared it between the early (recurrence within 1 year after previous session; Early-Group) and late phase (recurrence more than 1 year after previous session; Late-Group) recurrent cases. Also we compared the clinical outcome between the Early- and Late-Groups.

Result: There were 133 patients in the Early-Group and 50 patients in the Late-Group. Prevalence of PV reconnection was significantly higher in the Early-Group than that in the Late-Group (76% vs 40%, \( p<0.001 \)). However, prevalence of non-PV foci was significantly higher in the Late-Group than that in the Early-Group (56% vs 15%, \( p<0.001 \)). Multivariate Cox Hazard analysis revealed that the non-PV foci significantly associated with poor AF free survival ratio (Hazard Ratio: 8.334, \( p<0.001 \)). Kaplan-Meier analysis revealed that recurrence of AF after repeated session in the Late-Group was significantly higher than that in the Early-Group (log-rank test: \( p=0.010 \)). However, there was no significant difference of AF recurrence after repeated session when the reason of late recurrence of AF was non-PV foci from superior vena cava (log-rank test: \( p=0.762 \)).

Conclusion: PV reconnection was frequent in the early recurrence cases, while the non-PV foci was often observed in the late recurrence cases. Non-PV foci resulted in the poor clinical outcome in late recurrence cases, however non-PV foci from superior vena cava were curable trigger for AF.