Introduction: Atrial fibrillation (AF) is a progressive disease, and the mechanism is unclear in patients who recurred after 3-years of AF catheter ablation (AFCA). We explored the potential mechanisms of AF long-term recurrence (LTR) 3-years after AFCA.

Methods: Among 2,209 consecutive patients who underwent AFCA, 1,325 patients (59±11 years, 72.5% male) who underwent regular rhythm follow-up > 3-years were enrolled in this study. Among them, 659 patients remained in sinus rhythm (RSR), 327 patients recurred in 3-months–1-year (short-term recurrence; STR), 235 patients recurred in 1–3-years (mid-term recurrence; MTR), and 104 patients recurred after 3-years (long-term recurrence; LTR). Among recurred patients, 218 underwent repeat procedures: 112 in STR, 80 in MTR, and 26 in LTR.

Result: Pre-ablation left atrial (LA) dimensions were larger in STR (p<0.001) and MTR groups (p<0.001), but not in LTR group than in RSR group. But, low LA voltage was independently associated with LTR (adjusted HR 0.57 [0.36-0.92], p=0.022). In the redo-mapping, the numbers of reconnected pulmonary vein PVs (PVs) were 2 (IQR: 0-3) in STR group, 1.5 (IQR: 0-3) in MTR group, and 1 (IQR: 0-2) in LTR group (p=0.030). Post-ablation extra-PV triggers were more commonly found in LTR group than in STR or MTR groups (40.9% in LTR to 19.2% in STR, p=0.014 for trend) at the 2nd procedure.

Conclusion: LTR patients showed similar baseline LA size and significantly low LA voltage than RSR group. In repeat procedures, number of reconnected PVs was lower, but extra-PV trigger was more common in LTR than in STR or MTR.