MECHANISMS AND CHARACTERISTICS OF RECURRENT ATRIAL ARRHYTHMIAS AFTER PULMONARY VEIN ISOLATION OF ATRIAL FIBRILLATION

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Background: The mechanisms of recurrent atrial fibrillation (AF) after pulmonary vein isolation (PVI) catheter ablation are not well defined. Prior studies have reported pulmonary vein (PV) reconnections as a dominant mechanism of AF recurrence, but the prevalence of non-PV triggers and focal or rotational drivers is not well characterized in patients with recurrent AF.

Methods: Patients at UCSD and VA San Diego who underwent repeat ablation for recurrent AF after PVI were analyzed retrospectively. The prevalence of PV reconnections, induced macro-reentrant atrial flutters (AFL), atrial tachycardias (AT) and premature atrial contractions (PACs) were identified using standard mapping techniques. In patients without clear triggers, the presence of rotational or focal drivers was identified using either high resolution non-contact dipole density mapping (AcQMAP, Acutus) or contact phase mapping (FIRMmap, Abbott).

Results: In 74 patients with recurrent AF (Age 66±9 yrs, 59% persistent AF, LA diameter 4.3±0.8cm), PV reconnections were found in 46 patients (62%). Macro-reentrant AFLs were induced in 27 patients (36%). AT or PAC triggers were identified in only 22 patients (29%). 28 patients (38%) had persistently isolated PVs. Of these, only 9 patients (31%) had atypical AFL and 15 patients (55%) had no identifiable triggers. Rotational or focal drivers during AF were found in all patients who underwent driver mapping (2.8±1.1 rotors/patient (Figure); the most common locations were the LA anterior and posterior walls.

Conclusion: Recurrent AF after prior PVI ablation may occur due to multiple mechanisms. PV reconnections occurred in half of patients rotational or focal drivers throughout the atria may be a dominant AF mechanism in patients with recurrent AF. Prospective studies are needed to confirm these findings.