Ultra-High-Density Mapping to Characterize Recurrent Atrial Tachycardia and Conduction Gaps after Single-Ring Isolation of the Posterior Left Atrium for Atrial Fibrillation

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Introduction: En bloc electrical isolation of the posterior wall of the left atrium (LA) remains challenging and may result in recurrent intra-atrial reentrant tachycardia (IART) due to gaps along the isolation lines. Utilizing ultra-high-density three-dimensional electroanatomical mapping provides novel insights into the isolation gaps and arrhythmia mechanisms. We sought to identify isolation gaps and IARTs mechanisms after single-ring posterior LA isolation utilizing ultra-high-density mapping.

Methods: Consecutive patients presented with recurrence of arrhythmia following single-ring posterior LA isolation for atrial fibrillation (AF) undergoing the repeat ablation utilizing ultra-high-density mapping were included in this study.

Result: 27 pts (age 61 ± 11; 56% males; 34% with non-paroxysmal AF) were studied. A total of 20 atrial tachycardias (ATs) in 13 patients observed during the procedures. 90% of these tachycardias were IARTs and only 10% were focal ATs. IARTs were gap related reentries utilizing gaps of previous isolation line (n=7), peri-mitral reentries (n=4), dual loop reentry with peri-mitral reentry and reentry around left atrial appendage (n=1), cavo-tricuspid isthmus dependent reentry (n=5), and LA localized micro reentry (n=1). A single acquired activation map during AT (Figure A-F) or pacing from coronary sinus could identify multiple conduction gaps simultaneously. The gaps in the box were more commonly seen at three locations, the roof line adjacent to the right superior pulmonary vein (PV), mid portion of the roof line, and the antero-inferior aspect of the left inferior PV (Figure G). Posterior LA isolation was successfully achieved by targeting isolation gaps detected by ultra-high-density mapping in all patients.

Conclusion: Ultra-high-density mapping is useful in identifying gaps in isolation lines in the box and in elucidating mechanism of recurrent IARTs after single-ring posterior LA isolation.