

In Silico Mapping of Interatrial Loops during Batrial Tachycardia

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Background: Batrial tachycardias (biAT) are complex arrhythmias involving electrical propagation between the right (RA) and the left atrium (LA) through the interatrial connections (IACs). Critical pathways along the IACs may contribute to arrhythmia maintenance during atrial fibrillation (AF), but remain clinically underdetected due to challenges in identifying IACs from the endocardium. **Methods:** An in silico model to study biAT was developed. A patient-specific batrial bilayer model derived from MRI was augmented to include the Bachmann's bundle (BB), fossa ovalis, upper posterior, and coronary sinus connections. Paroxysmal AF-induced remodeling was simulated using the Courtemanche ionic model. Reentry was induced using a decremental pacing protocol and biAT was sustained for 5 s. Critical pathways across 6 possible interatrial loops were identified on the epicardial surface using the openDGM framework. Extracellular potentials were computed on the endocardial surface using a five-spline multipolar radial catheter positioned in the vicinity of the BB in both atria. **Results:** Endocardial bipolar EGMs had different activation patterns across the BB during biAT. Bipolar EGMs on the RA showed slightly higher number of BB activations than the ones in the LA (36.7 ± 1.5 vs 31.8 ± 6.4). Epicardial unipolar EGMs alone did not aid identifying critical pathways from the endocardium. **Conclusions:** This study represents a first step toward identifying critical interatrial pathways and personalizing batrial electrical coupling in computational models. Identification of critical pathways remains highly dependent on catheter configuration.

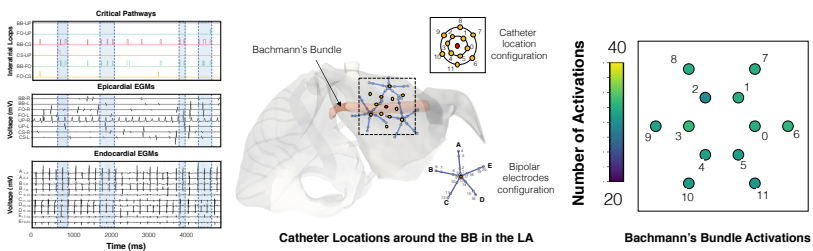


Figure 1. Comparison of different electrode configurations for the localization of the Bachmann's Bundle and the analysis of critical pathways during batrial tachycardia.