

Non-Invasive Assessment of Reentrant Activity during Atrial Fibrillation: Comparison with Basket Mapping

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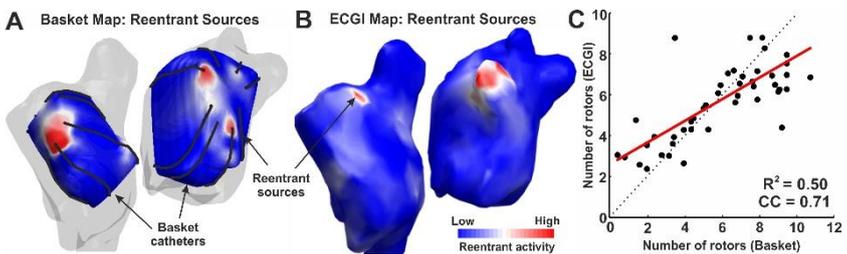
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Non-invasive characterization of atrial fibrillation (AF) electrical patterns through reentrant activity analysis has been used to guide ablation procedures, although no systematic comparison with panoramic endocardial recordings have been done yet. The purpose of this study is to provide an evaluation of Electrocardiographic Imaging (ECGI) technique for identifying reentrant drivers compared with panoramic basket mapping recordings.

Bi-atrial endocardial electrograms of 47 AF patients at ablation (30 persistent, 29 male, 63±9 years) were recorded with 64-pole basket catheters and simultaneous 57-lead body surface ECGs. Atrial epicardial electrical activity was reconstructed through ECGI and reentrant activity was identified in 3D- invasive and non-invasive activity using phase singularity (PS) tracking.

Non-invasive maps showed more re-entrant AF drivers near to intracardially-detected re-entries than elsewhere, both in PS density (2.3 ± 2.1 vs 1.9 ± 1.6 , $p=0.02$) and rotor presence (3.2 ± 2.3 vs 2.7 ± 1.7 , $p=0.02$). Global AF reentrant activity measured as number of phase singularities or stable rotors showed higher concordance ($CC=0.71$). Moreover, noninvasive AF reentrant activity, i.e. total number of ECGI sources, was lower in ablation termination vs. non-termination cases (6.8 ± 4.2 vs 8.9 ± 5.0 , $p=0.01$).

Non-invasive ECGI can accurately describe AF reentrant activity, calibrated to endocardial mapping, and may also guide specific re-entries during AF. This approach may assist in bedside monitoring of therapy or in guiding the efficacy of ongoing ablation procedures.



A. Reentrant activity map reconstructed from 3D-phase based analysis of 64-poles basket EGMs. B. Reentrant activity map reconstructed from non-invasive (ECGI) signals. C. Number of reentrant sources in ECGI vs EGM.