Propagation pattern analysis of panoramic mapping from patients with persistent atrial fibrillation

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**Background:** Atrial fibrillation (AF) is the most prevalent type of cardiac arrhythmia. Despite extensive basic and clinical research, the mechanisms underlying AF are still controversial. The purpose of this study is to analyze the electrical propagation patterns from patients with persistent AF to provide critical insights with respect to the mechanisms underlying AF maintenance.

**Methods:** 1-minute unipolar electrograms were recorded sequentially in both atrial chambers from 5 patients with persistent AF prior to ablation using a 64-electrode basket catheter. Raw unipolar signals were processed using a suite of signal processing approaches including: 1) A Savitzky-Golay filter based on a polynomial regression, 2) a standard QRS subtraction and 3) a local variability approach which uses the local integral of a fixed sized sliding window to enhance the signals. Recurring patterns of electrode activation and AF drivers were then identified by using activation time maps, dominant frequency analysis and by screening through the entire isopotential movies of each basket recording.

**Results:** Localized sources in the form of either localized reentries (N=1) or focal impulses (N=4) were observed in all of the patients studied. Interestingly, all localized sources were found in the left atrium (LA) near the pulmonary veins (PV) with the exception of 1 patient where an additional focal impulse was also detected in the right atrium (RA). Disorganized activity was observed in the RA of 3 patients, though their respective LAs were driven either by reentries or focal impulses.

**Conclusions:** Our study by analyzing panoramic mapping electrograms recorded using basket mapping systems demonstrates that localized sources are the main driver of persistent AF. Although disorganized activity has been observed in the RA, they may have arisen from localized sources situated in the LA generating anarchical wavelets in remote areas.

**Scheme results:** S/I VC: Superior/Inferior Vena Cava, R/L S/I PV: Right/Left Superior/Inferior Pulmonary Vein