

# Analysis of Atrial Fibrillation Dynamics in Body Surface Potential Maps and Electrocardiographic Imaging

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**Introduction.** Previous studies have shown that global short- and long-term atrial fibrillation (AF) dynamics can be characterized non-invasively by means of Body Surface Potentials (BSPM) and linked to treatment outcome. On the other hand, Electrocardiographic Imaging (ECGI) may add valuable information as it can be used to characterize locally the atrial substrate non-invasively. The objective of this study is to compare AF dynamics characterized on both BSPM and ECGI signals.

**Methods.** Two consecutive 4-second BSPM signals from 34 AF patients (23 male, 8 paroxysmal,  $63.1 \pm 9.5$  years) were recorded, followed by ECGI computation. Short- and long-term AF dynamics metrics were computed in both BSPM and ECGI, in terms of the strength of their repetitive behavior, assessed from a multivariate autocorrelation of the signals. Features of short- and long-term AF dynamics capture the strength of short-term (about half to one AF cycle length) and long-term (0.58-1.75 sec.) recurrent behavior of the AA propagation, respectively.

**Results.** BSPM features of short-term dynamics of half and full AF cycle positively correlated with long-term dynamics (Fig. A; 0.52 and 0.78, respectively). Analogous values of correlation were obtained in ECGI signals (Fig. 1B). When normalized by the long-term dynamics, the short-term dynamics inversely correlated with the speed of propagation of AF at half AF cycle (BSPM,  $r = -0.28$  vs. ECGI,  $r = -0.45$ ), showing higher stability in the short-term propagation for faster AF.

**Conclusion.** BSPM and ECGI reflected similar relationships in the analysis of AF propagation dynamics. Results were consistent with previous studies and suggest that BSPM is sufficient to characterize global AF dynamics, while ECGI may become relevant when more localized information is required.

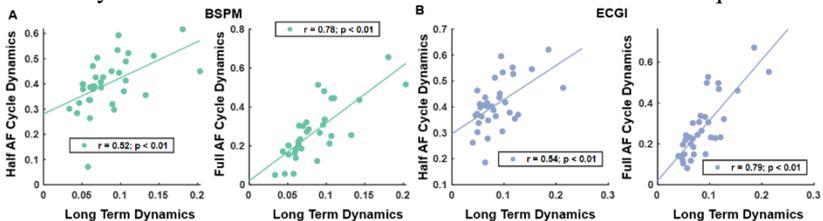


Figure 1. Scatter plot of short-term and long-term AF dynamics for BSPM (A) and ECGI (B) at half and full AF cycle.