

Non-invasive Conduction Velocity Estimation during Sinus Rhythm in Atrial Fibrillation Patients

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Introduction: Conduction velocity (CV) heterogeneities are a well-known mechanism of cardiac arrhythmia initiation and perpetuation. Nevertheless, the relevance in locating areas of low CV in AF patients does not prevail in clinical practice.

Aims: The purpose of this study is to show how non-invasive CV measures can be useful during sinus rhythm to characterize patients with atrial fibrillation (AF).

Methods: CV measurements were tested on realistic complex atrial models during sinus rhythm and AF on realistic simulations with imposed left atrial remodeling. Next, 5 AF patients (3 persistent, 3 male, 59 ± 6 years) were selected with the particularity that they were in sinus rhythm at the record time. After ECGI recordings, AF was induced and the patients were subjected to ablation. Dominant frequency (DF) and reentrant activity analysis were calculated for each one. Comparisons between CVs in sinus rhythm and AF markers were done to illustrate a proof of concept of clinical applicability.

Results: In models, the metrics performance showed a $CC=0.867$ and $RDMS=0.515$ comparing CV in the sinus model with its ECGI outcome and $CC=0.872$ and $RDMS=0.506$ in the case of AF. In patients, the confidence interval of the CVs distributions was from 15.67 ± 4.9 to 156.78 ± 3.7 cm/s. Areas with greater DF recurrences were in areas of low CV, below 50.6 ± 14.2 cm/s, showing a good spatial correspondence (Fig).

Conclusions: Our proposed method allows the estimation of CVs during simple patterns and could serve to stratify AF patients or help create new ablation strategies.

