

ECGi Metrics in Atrial Fibrillation Dependency on Epicardium Segmentation.

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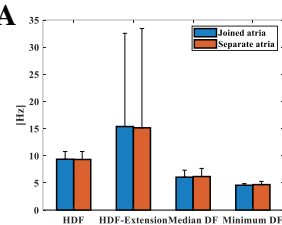
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Noninvasive electrocardiographic imaging (ECGi) is a useful tool that can be used to guide ablation procedures in atrial fibrillation (AF patients). Most ECGi resolutions are based on the Boundary Element Method, and thus application of Green's theorem, that requires that electrical sources reside inside a closed volume.

The objective of this work is to quantify the errors in atrial fibrillation metrics that can be expected if two volumes are segmented for the atria instead of just one.

We segmented 11 different atria from magnetic resonance imaging in two different ways: left and right atrium together in a single volume and separated into two volumes. For both models of the same heart, using the electrical recordings of each patient, the inverse problem was calculated, and metrics that quantify dominant frequencies and the presence of rotors were evaluated. We studied the differences between the two segmentation groups with a paired Student's t test.

The highest dominant frequency (DF) was found to be similar when calculated with two atrial volumes and just one (9.36 vs. 9.31 Hz, $p > 0.05$) and same results were observed for the rest of the metrics related with the quantification of dominant frequencies. The amount of rotors per second, as well as singular points were higher when measured on separate atria ($8.32e+03$ vs. $8.98 e+03$, $p < 0.05$; 118.82 vs. 137.52 , $p < 0.05$ respectively) while the mean rotor duration was higher in the single-volume atria (0.063 vs. 0.06 $p < \sim 0.05$).



B Rotor Histogram

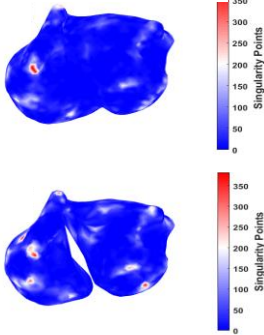


Figure 1. A. Mean and standard deviation of dominant frequency metrics. **B.** Rotor Histogram obtained for a patient where the amount of singular points is represented.

We can conclude that segmenting the atria of the patients into two volumes instead of one does impact on rotor-related AF metrics that can be derived from ECGi whereas dominant-frequency metrics are less affected.