

# Effect of Torso Mesh Density on Electrocardiographic Imaging Resolution from Atrial Fibrillation Simulations

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**Introduction.** Electrocardiographic Imaging (ECGI) allows estimating the epicardial electrical activity using anatomical information of the patient and multiple body surface electrograms. In the present study, the effect of the number and distribution of nodes constituting torso meshes on the ECGI accuracy is analyzed using atrial fibrillation (AF) simulations.

**Methods.** 3D meshes of the torso of 10 patients with 100 to 2000 nodes with either a heterogeneous or a homogeneous distribution were created. Signals of 9 AF realistic electrophysiological simulations were used for computing the forward and inverse problems. The resulting ECGI for each torso mesh was compared with the ECGI computed with a 4000 nodes reference torso. Correlation coefficient of electrograms, and relative difference of dominant frequency were computed to evaluate each torso mesh and electrode distribution with the respective ground truth.

**Results.** Torso meshes with higher number of nodes and a homogenous node distribution achieved better ECGI reconstructions in terms of correlation coefficients (values ranging from  $0.79 \pm 0.04$  to  $0.88 \pm 0.02$ ). Relative errors in dominant frequency estimations showed the same trend, from  $(0.67 \pm 0.17$  to  $0.37 \pm 0.17$  Hz). Meshes of more than 400 nodes don't improve significantly the ECGI reconstruction.

**Conclusion.** Meshes with at least 400 nodes homogeneously distributed are recommended for computing the ECGI during atrial fibrillation. Distances between nodes of the torso meshes longer than 4 cm should be avoided.

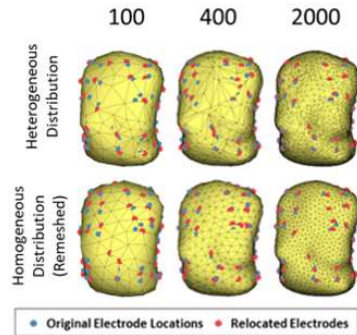


Figure 1. Example of torso with the different node densities and distributions.

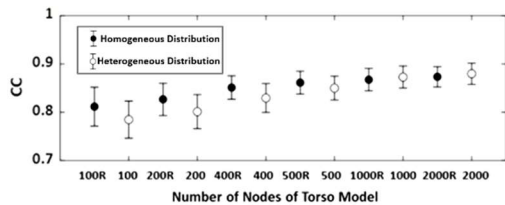


Figure 2. Evolution of ECGI correlation with the best ECGI reconstruction for the different torso meshes and 9 AF simulations.