Differences in Non-Invasive Imaging of Atrial and Ventricular Recovery

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Recently we have reported on progress made in a non-invasive method for imaging the timing of depolarization (*dep*) and repolarization (*rep*) based on observed body surface potentials. The method uses an equivalent double layer at the surface bounding the myocardium having a strength proportional to the local transmembrane potentials. The timing was found by minimizing the difference between observed body surface potentials and those based on the source description. The parameter estimation procedure involved is non-linear and, consequently, requires the specification of an initial estimate. For the timing of depolarization the initial estimate was found by using the fastest route algorithm, for the timing of repolarization the initial estimate additionally took into account electrotonic effects: with longer *ARI* (*ARI* = *rep* - *dep*) values at local minima in the timing of *dep* and shorter ones at locations exhibiting local maxima of *dep*.

We compared the application of the subsequently required regularization procedure, applied to either the timing of regularization, *rep*, or to the *ARI* values, in applications to atria and ventricles. The results are listed in the table shown below.

Ranges (in ms) of *ARI* and *rep* values found by regularizing either of these parameters

Regularized parameter applied to	Atria		Ventricles	
	ARI range	*rep* range	*ARI* range	rep range
ARI	75 - 119	100 - 215	186 - 281	268 - 327
rep	54 - 156	158 - 190	176 - 300	276 - 325

As can be seen, the estimated dispersion in *ARI* values is smaller if the regularization is applied directly to the *ARI* parameters. Those values for the atria are much smaller than those for the ventricles, as is in agreement with large-scale ion-kinetics modelling of the myocardium. Those of the ventricles are larger than those of atria due to the differences in wall thickness, the involvement of the Purkinje system and intrinsic differences of ion kinetics of left and right ventricle. These results indicate that for both the atria and ventricles the *ARI* is the preferred parameter to be regularized.