ACCURATE CARDIAC TISSUE DESCRIPTION IN COMPUTATIONAL MODELING OF RADIOFREQUENCY ABLATION

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Abstract. Radiofrequency catheter ablation (RFA) is a common, minimally invasive procedure to treat cardiac arrhythmias. A catheter is advanced through the patient's groin onto a cardiac chamber where the arrhythmogenic tissue is destroyed via electrocautery. Although RFA modeling is a reasonably mature field and Penne's Bioheat equation [1] is the standard to describe the power delivery to the tissue, the level of uncertainty in predicting the outcome of a given protocol remains significant. The electrode footprint (namely the contact surface between the catheter tip and the cardiac wall) is a major determinant to the power actually dissipated in the tissue and depends (among others) on the tip shape, the catheter orientation, the applied contact force, and the tissue response to it.

In this talk we will present a model that combines an orthotropic, nearly-incompressible, hyperelastic description for the tissue that accounts for the cardiac fibers, a three-state cell death model that accounts for the potential recovery of the damaged cells, as well as an improved electrical model that accurately captures the electric field of an in-vitro experimental settings.

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Mathematics Subject Classifications (2010):

References

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