Improving Automated Pacing at the End of the Effective Refractory Period

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Atrial fibrillation (AF) vulnerability is one of the key metrics used in in silico studies to assess arrhythmia mechanisms and to evaluate personalized ablation strategies. The pacing at the end of the effective refractory period (PEERP) protocol by Azzolin et al. is commonly used to predict in silico vulnerability. However, identification of the ERP can fail in models with patchy fibrotic regions. This work introduces a new method to find the ERP based on local activation times (LATs). This new method, combined with further improvements and refactoring applied to PEERP, is compared against the old version based on one tissue patch and 22 patient-specific bi-atrial models. Using the tissue patch example, we describe how PEERP can fail in fibrotic border regions at detecting the correct ERP. The 22 personalized models comprised a total of 1136 stimulation points. While the old PEERP protocol induced 438 reentries, the new protocol found 110 more inducing points (548). This improved implementation provides a well-defined induction method suitable for comparing AF inducibility.