# Subject-Specific Ablation of Pathologic Conduction Patterns Beyond the Pulmonary Veins: A Personalised Modelling Approach

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**Introduction:** Treatment options for persistent atrial fibrillation (PsAF) remain elusive with 40-60% arrhythmia recurrence post de novo pulmonary vein isolation (PVI). Targeting subject-specific, non-PV pathologic conduction patterns (PCP) observed during AF has recently shown encouraging results in PsAF patients returning for their first or second retreatment (76% freedom from AF). This study aims to assess the efficacy of sequential ablation strategies using subject-specific computational modeling with the goal of maximising predictive accuracy while minimising the amount of tissue ablated per patient.

**Methods:** Subject-specific models were created for a small exploratory subset of patients (N=4) enrolled in the ongoing DISCOVER trial. The anatomical models and associated conduction velocity (CV) were obtained using the AcQMap system (Acutus Medical, Carlsbad), and simulations of parameterised subject-specific models were performed using the CARP simulation framework. PCP-targets were identified using the AcQMap system (**Fig.1A**), and a strategy to ablate and connect these targets to inert boundaries on the atria was simulated. Using the parameterised models (**Fig.1B**), a stepwise ablation approach was followed and the resultant AF complexity, or lack-thereof, was characterized at three stages via the density of phase-singularities across the anatomy (de novo, PVI, and PVI+PCP).

**Results:** AF complexity was highest in all patients prior to therapy. PVI showed a marginal decrease in complexity across the cohort. PVI+PCP showed an extensive decrease in the AF complexity across the patients (**Fig.1C**).

**Discussion:** This study used a stepwise ablation approach in subject-specific computational models to provide a means to guide effective therapy guidance towards optimal patient outcomes. Targeting pathologic propagation identified during AF effectively reduces AF complexity, and potentially improves long-term freedom from AF.

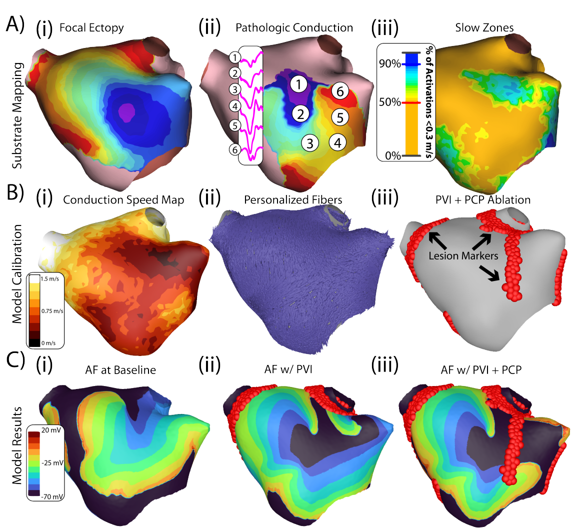


Figure 1. Subject-specific modelling pipeline simulating the effect of a stepwise ablation of PVI followed by sites of pathologic conduction.