Slow Conduction Corridors and Conduction Velocity Predict Atrial Fibrillation Recurrence After First Ablation

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Aims: This study aims to assess whether pre-ablation conduction velocity (CV) and local electrogram (EGM) characteristics within slow conduction corridors (SCCs) can predict atrial fibrillation (AF) recurrence in patients undergoing their first pulmonary vein isolation.

Methods: Pre-ablation electroanatomical maps from 45 AF patients (n=9 with recurrence) undergoing first-time PVI were analyzed. Global CV metrics, including the median CV, were calculated. SCCs were defined as regions with CV < 0.5 m/s. Within these regions, features such as low-voltage zone (LVZ) burden, peak-to-peak voltage, and signal fractionation were quantified using local EGMs. The prognostic significance of these variables was evaluated using univariate and multivariate Cox proportional hazards models.

Results: A global median CV < 0.66 m/s was a strong predictor of recurrence (HR: 4.69, p=0.016). Within SCCs, an LVZ area $> 54.02\%$ (HR: 5.11, p=0.010) and high unipolar fractionation (HR: 5.20, p=0.009) emerged as significant independent predictors. Multivariate models combining global median CV < 0.66 m/s (HR: 8.25, p=0.007) with SCC LVZ $> 54.02\%$ (HR: 6.89, p=0.008) showed the highest prognostic performance.

Conclusions: Both global CV and localized abnormalities within SCCs are robust predictors of long-term AF recurrence. Their combined use improves risk stratification and may support the development of personalized ablation strategies.

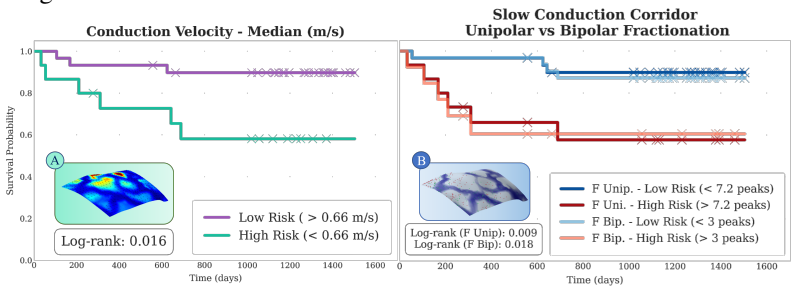

Figure 1. Kaplan-Meier survival curves for median CV (A) and EGM Unipolar and Bipolar fractionation in SCCs (B), with AF recurrence as the endpoint.