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Automatic Multilead Characterization of F-wave Amplitude Enhances Prediction of Catheter Ablation Outcome in Persistent Atrial Fibrillation

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Introduction: Fibrillatory wave (f-wave) amplitude is widely regarded as a predictor of catheter ablation (CA) outcome in persistent atrial fibrillation (PAF). However, its value has been so far manually computed, thus it is prone to inaccuracies. Moreover, it is usually examined in only one ECG lead, e.g., V_1 and II, thus neglecting information provided by the other ones. This study shows that f-wave amplitude spatial distribution on the 12-lead ECG is predictive of CA outcome.

Methods: CA of PAF (AF episode duration of 9±14 months) was performed in 36 patients (pts; 34 males, 61±11 y) in a stepwise manner. Standard ECG was acquired at the beginning of CA. ECG is processed by principal component analysis (PCA) so as to enhance its maximum-energy components. F-wave amplitude D_8 is automatically determined on a subset of ECG leads (I, II + V_1-V_6). Clinical outcome is assessed by logistic regression (LR) and area under curve (AUC) analysis.

Results: After 1.08 procedures/pt and a 8±4 m follow-up, 29 pts (81%) had no AF recurrence. The multilead approach is predictive of CA outcome, whereas single-lead computation of f-wave amplitude in V_1 ($D(V_1)$) is not (see table).

Conclusions: Automatic calculation of f-wave amplitude spatial distribution effectively distinguishes between successful and failing CA procedures and overcomes classical manual single-lead measurements.

LR	Non AF recurrence	AF recurrence	*p*	AUC	Sensitivity	Specificity	Cutoff
D_8	0.90±0.11	0.42 ±0.41	$1.95 \cdot 10^{-6}$	0.88	0.93	0.71	0.69
$D(V_1)$	0.81±0.04	0.79 ±0.07	0.45	0.56	0.52	0.71	0.82