

Limb Versus Precordial ECG Leads as Improved Predictors of Electrical Cardioversion Outcome in Persistent Atrial Fibrillation

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Background and Aim: Electrical cardioversion (ECV) is an effective, simple low-cost rhythm control strategy for persistent atrial fibrillation (AF). Because of its limited mid- and long-term success rates, prediction of early failure could avoid patients with reduced chance to maintain sinus rhythm (SR). To this purpose and due to its proximity to the right atrium several indices characterizing atrial activity (AA) have been proposed based on lead V1. However, information from other leads have been discarded to date. This work studies how effective some common indices computed over the whole set of 12 standard ECG leads are in predicting ECV outcome with respect to just V1.

Methods: Before ECV, a 12-lead ECG was recorded for 90s from 58 patients in persistent AF. The AA signal was independently extracted from each lead by adaptive QRST cancellation. Then, fibrillatory waves amplitude (FWA), dominant frequency (DF), and Sample Entropy (SampEn) were computed from the resulting 12 signals and correlated with ECV outcome. After a follow-up of 4 weeks, 27 patients maintained SR and the remaining 31 relapsed to AF.

Results: Although lead V1 often presents the largest AA, best results in terms of area under ROC curve (AUC) were noticed among limb leads (see the table below). The best performance for FWA was obtained from lead II, reporting an AUC of 69.5% and thus outperforming accuracy for lead V1 by 12%. DF showed an AUC of 81.1% over lead aVL, then outperforming V1 by 6%. Finally, SampEn achieved the highest AUC (78.7%) over lead II, increasing accuracy for V1 by 5%.

Conclusions: Considering AA characterization from the more accessible limb leads, particularly from II and aVL, has proven to be a more suitable choice to improve AF ECV outcome prediction from the surface ECG.

Parameter	I	II	III	aVR	aVL	aVF
FWA	0.597	0.695	0.656	0.621	0.680	0.658
DF	0.711	0.783	0.777	0.698	0.811	0.802
SampEn	0.646	0.787	0.663	0.648	0.731	0.762

Parameter	V1	V2	V3	V4	V5	V6
FWA	0.576	0.559	0.542	0.562	0.618	0.645
DF	0.757	0.724	0.716	0.702	0.667	0.644
SampEn	0.747	0.665	0.650	0.667	0.694	0.669