ECG-derived AF complexity parameters predict AF rhythm control success but different populations might need different parameters

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INTRODUCTION The success rate of a rhythm control strategy in patients with persistent atrial fibrillation is far from satisfactory. It would be highly desirable to identify patients likely to have success of such a strategy. We combined two studies of patients with persistent AF referred for rhythm control to come up with a non-invasive AF complexity parameter suitable for all patients with persistent AF.

METHODS We included 2 cohorts of patients with persistent AF. Patients in the first cohort underwent a stepwise radiofrequency ablation with long term follow-up. The second cohort consisted of patients referred for electrical cardioversion (ECV). In both cohorts a 10 seconds digitally recorded ECG was exported for analysis. We analyzed a combination of non-invasive complexity parameters covering both the time- and frequency domain (F-wave amplitude (FWA), dominant frequency (DF), organization index, sample and spectral entropy).

RESULTS The ablation cohort included 93 patients with persistent AF with a median AF episode duration of 12 months. At the end of a mean follow-up period of 5.6 years with a median of 2 ablations, 72 patients (77%) were in sinus rhythm (SR). ECG parameters predicted long-term ablation success better than clinical parameters (mean AUC 0.82 vs 0.68 respectively). In this cohort the FWA was the best ECG-predictor.

The cardioversion database included 210 patients with a median AF episode duration of 3 months. After 1 month follow-up 64 patients (30%) had an AF recurrence. The AF complexity parameters did not predict AF recurrence regardless of the ECG leads analyzed. After 1 year follow-up however, AF recurred in 135 patients (64%) which could be predicted. The best clinical predictor was use of AAD (especially amiodarone). The DF proved to be the best ECG parameter for the prediction of AF recurrence. The DF was significantly higher in almost all ECG-leads in patients with an AF recurrence. A higher FWA did not predict SR after one year.

DISCUSSION We studied two different cohorts with persistent AF patients referred for a rhythm control strategy. Our results do confirm the hypothesis that non-invasive AF complexity parameters derived from a standard 12 lead ECG can predict success of a rhythm control strategy for AF. However, this study also showed that there is no "one-size fits all parameter". This could be due to the different AF episode duration between the groups, different rhythm control strategy or recurrence mechanism.