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Antonio R. Hidalgo-Muñoz, Decebal G. Latcu, Marianna Meo, Olivier Meste, Irina Popescu, Nadir Saoudi, Vicente Zarzoso



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Spectral and Spatiotemporal Variability ECG Parameters Linked to Catheter Ablation Outcome in Persistent Atrial Fibrillation

Antonio R. **Hidalgo-Muñoz***^a, Decebal G. **Latcu**^b, Marianna **Meo**^c, Olivier **Meste**^a, Irina **Popescu**^b, Nadir **Saoudi**^b, Vicente **Zarzoso**^a

^a I3S Laboratory, University of Nice Sophia Antipolis, CNRS, 2000 route des Lucioles, CS 40121, 06903 Sophia Antipolis Cedex, France.

^b Department of Cardiology, Princess Grace Hospital, 1 Avenue Pasteur, 98000 Monaco.

^c Electrophysiology and Heart Modelling Institute (IHU LIRYC), Hôpital Xavier Arnoz, Avenue du Haut Lévêque, 33604 Pessac Cedex, France

*Corresponding author: E-mail: arhidalgom@gmail.com

Abstract: With the increasing prevalence of atrial fibrillation (AF), there is a strong clinical interest in determining whether a patient suffering from persistent AF will benefit from catheter ablation (CA) therapy at long-term. This work presents several regression models based on noninvasive measures automatically computed from the standard 12-lead electrocardiogram (ECG) such as AF dominant frequency (DF), spectral concentration and spatiotemporal variability (STV). Sixty-two AF patients referred to CA were enrolled in this study. Forty-seven of them had no recurrence after CA during an average follow-up of 14 ± 8 months. The ECG features were extracted from an ECG recorded before the CA intervention and they were combined by means of logistic regression. The combination of DF and STV values from different precordial leads reached $AUC = 0.939$, outperforming the best results by using only one kind of features, such as DF ($AUC = 0.801$), and yielding a global accuracy of 93.5% for discriminating the best long-term responders to CA. These results point out the need to take into consideration the spatial variation of spectral ECG parameters to build predictive models dealing with AF.

Keywords: atrial fibrillation; catheter ablation; ECG; logistic regression; predictive model; spatiotemporal variability; spectral feature

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