

# Predicting Atrial Fibrillation Recurrence After Catheter Ablation Through Time Variability of P-wave Features

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**Background and Aim.** Pulmonary vein (PV) isolation is nowadays the cornerstone for the treatment of paroxysmal atrial fibrillation (PAF). However, its success rate is not as high as clinically desirable, and repeated procedures are often required. Beyond PV reconnection, other causes for AF recurrence have been identified, such as existence of extra-PV foci or an advanced atrial substrate remodeling. Hence, the development of noninvasive, pre-ablation predictors of the procedure failure is essential to enable tailored approaches. Although, for that purpose several P-wave features have been analyzed from short ECG recordings, their time variability has not been studied yet. This work explores the ability of time variability of two common P-wave parameters to anticipate cryoablation failure in PAF patients.

**Methods.** Just before ablation, a standard 12-lead ECG was recorded continuously for 5 minutes from 45 PAF patients. All P-waves in lead II were detected and delineated with an automatic algorithm previously published. Duration and amplitude of all waves were computed, and then mean, standard deviation (std), and coefficient of variation (CV) were obtained for both parameters and correlated with ablation outcome. After 9 months of follow-up, 31 patients maintained sinus rhythm and the remaining 14 relapsed to AF.

**Results.** According to previous works, mean values of P-wave duration and amplitude were shorter and larger for patients who maintained SR and relapsed to AF, respectively (see the table below). However, no statistically significant differences were noticed between both groups. Contrarily, CV for both parameters reported a better separation between groups, being  $p$ -value  $< 0.05$  in both cases. Moreover, improvements about 10% in accuracy were obtained by CV with regards to mean values, reaching values about 74%.

**Conclusions.** Time variability of the P-wave can provide new insights about atrial conduction heterogeneity, thus improving preoperative predictions of cryoablation outcome.

P-wave		SR group	AF group	$p$ -value	Se(%)	Sp(%)	Acc (%)
Duration	Mean (ms)	154.7±21.4	156.3±30.7	0.607	57.1	61.4	60.0
	Std (ms)	15.1±5.3	21.4±9.6	0.020	71.4	71.0	71.1
	CV (%)	9.7±3.0	13.4±4.7	0.003	71.4	74.2	73.3
Amplitude	Mean ( $\mu$ V)	71.7±28.3	57.9±19.6	0.211	64.3	52.6	56.6
	Std ( $\mu$ V)	11.3±0.5	12.4±0.6	0.447	57.1	54.8	55.6
	CV (%)	17.3±9.5	23.4±11.2	0.035	64.3	64.5	64.4