

Quantitative Evaluation of Temporal Occurrence Patterns of Paroxysmal Atrial Fibrillation

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Introduction: Flow velocity in left atrial appendage decreases when paroxysmal atrial fibrillation (PAF) progresses to longer episodes, suggesting that temporal PAF occurrence patterns may be related to risk of thrombus formation. The aim of this study is to investigate descriptors for quantitative evaluation of temporal PAF occurrence patterns.

Methods: Two descriptors were investigated, where the aggregation \mathcal{A} evaluates temporal distribution of PAF episodes, whereas the Gini coefficient \mathcal{G} quantifies differences in episode duration. The descriptors were investigated on three *PhysioNet* databases with annotated PAF episodes (MITDB, AFDB, LTAfDB), resulting in a total of 102 PAF records with 7742 episodes. Three types of PAF patterns were manually defined, namely, clustered episodes in a single time interval; clustered in several time intervals; episodes spread throughout the entire monitoring period.

Results: The different PAF patterns were well-reflected by \mathcal{A} and \mathcal{G} . \mathcal{A} and \mathcal{G} assume similar values for patterns with highly aggregated episodes, however, they differ considerably when episodes are clustered in several time intervals.

Table. \mathcal{A} and \mathcal{G} for different PAF pattern type (mean \pm confidence interval).

Pattern type	\mathcal{A}	\mathcal{G}
Single cluster	0.76 ± 0.07	0.79 ± 0.07
Several clusters	0.60 ± 0.08	0.78 ± 0.09
Spread	0.12 ± 0.07	0.16 ± 0.09

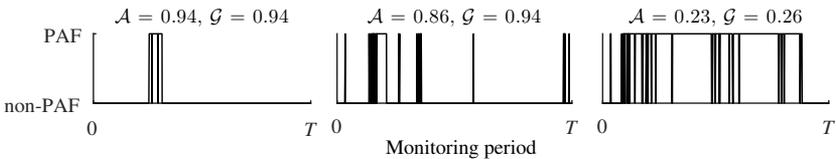


Fig. \mathcal{A} and \mathcal{G} for PAF patterns with a single (left) and several clusters (middle), and episodes spread throughout the monitoring period (right).

Conclusion: The descriptor \mathcal{A} is better suited for discriminating different temporal PAF occurrence patterns. This descriptor may have relevance when studying pattern relationship with the risk of thrombus formation.