Analysis of P-wave Changes for Prediction of Atrial Fibrillation Episodes

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Purpose:

Atrial Fibrillation (AF) is the most prevalent arrhythmia in clinical practice, increasing the risk of stroke and all cause mortality[1]. It usually initiates as a paroxysmal activity (PxAF), with the subject having sinus rhythm (SR), with interleaved AF episodes.

Data & Methods:

ECG recordings[4] from subjects with PxAF recorded at State University of St. Petersburg (Russia).

- 35 ambulatory (1 - to - 7 day) Holter recordings with an average duration of 104 hours (range: 21-156 hours)
- Four 12-leads recordings: fs = 250 Hz
- Thirty-one 3-leads recordings: fs = 257 Hz
- Annotation of AF episodes[4] based on fuzzy logic[5], involving information on ventricular rhythm [6], atrial activity, P-wave morphology, and atrial morphology.

Results:

- Power and relative power:
  - $P_{PCA}$ increased from 60 to 30 min ($p=0.015$)
  - $P_{rCA}$ increased from 60 to 30 min ($p=0.006$) and from 60 to 5 min ($p=0.002$).
  - No significant differences were found in the $P_{HF}$ by none of both methods.

- Duration: a significant increase was found in:
  - $D_{PCA}$ from 60 to 30 min ($p=0.00022$) and from 60 to 5 min ($p=0.00017$).
  - $D_{rCA}$ from 60 - 5 min ($p=0.011$).

Conclusions:

- P-wave morphology significantly changes prior to the onset of AF episodes in PxAF making more complex P-wave loop, and enlarging its duration, which can be attributed to the destructuring of the atrial wavefront. These results should be further investigated in larger populations to corroborate the significance of the clinical markers as predictors to AF episodes.

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