

# Respiratory Sinus Arrhythmia in apnea patients with apnea associated comorbidities

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**Aim:** To improve the phenotyping of apnea patients, it is crucial to consider their associated comorbidities. We hypothesize that the characterization of the cardiorespiratory interactions can be used for this task and for prioritizing the treatment of sleep apnea. Therefore, in this study we quantified the Respiratory Sinus Arrhythmia (RSA) in apnea patients with associated comorbidities.

**Methods:** Electrocardiographic (ECG) and thoracic respiratory signals from Polysomnographic (PSG) studies of 106 patients with different severities of sleep apnea and apnea associated comorbidities, were analyzed (age:  $47.3 \pm 10.6$ , Apnea Hypopnea Index (AHI):  $37.8 \pm 23.8$ , hyperlipidemia: 52, hypertension: 40, diabetes: 5, heart infarct: 4, stroke: 2). 5 minutes segments, free of apneas/hypopneas during non-REM sleep, were selected from each patient. Next, the R-peaks were detected and the Integral Pulse Frequency Modulation (IPFM) model was used to estimate the Heart Rate Variability (HRV). To quantify the RSA, the -3 dB bandwidth of the Power Spectral Density (PSD) of the respiratory signal was calculated. Afterwards, the power in the same band in the PSD of the HRV was extracted. Finally, this power was normalized with the power between 0.04 Hz and 1 Hz in the PSD of the HRV.

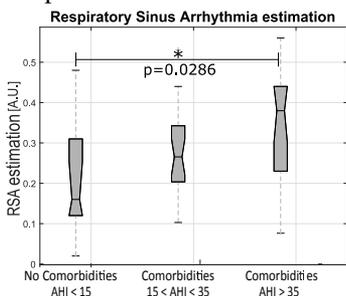


Figure 1. RSA in different groups under study

**Results:** A decrease in RSA was observed with age, agreeing with previous studies. However, patients with apnea associated comorbidities and AHI > 35 presented a significant increase of RSA compared to patients without associated comorbidities and AHI < 15 ( $p < 0.05$ ), as shown in figure 1. Additionally, the increases in RSA were unrelated to medication intake.

**Conclusion:** These results suggest an over compensation mechanism in apnea patients with apnea associated comorbidities and higher AHI that might result in an increased vagal tone during non-REM sleep and “normal” respiration. Further research is needed to clearly understand this apparent increased RSA and its potential role for phenotyping apnea patients.