Modulation of Atrial Fibrillatory Rate during Head-Up and Head-Down Tilt Test in Patients with Persistent Atrial Fibrillation

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Background

Atrial fibrillatory rate (AFR) has been regarded as a measure of atrial remodeling and slower AFR is associated with propensity to sinus rhythm maintenance after rhythm control interventions. While antiarrhythmic drugs are known to reduce AFR prior to restoration of sinus rhythm, the impact of autonomic nervous system on atrial fibrillatory process is less well studied. Sympathetic activation has been shown to increase AFR while parasympathetic stimulation effect on AFR in humans is less well studied.

We aimed to evaluate the dynamic change in atrial fibrillation rate associated with changes in body posture during Head Up (HUT) and Head Down (HDT) tilt.

Methods

Consecutive patients with persistent atrial fibrillation, referred for cardioversion were included for analysis of AFR during HUT and HDT (n=22, age 68 ± 8 years, 17 men, 18 patients with atrial fibrillation > 30 days). Patients with thyroid illness, significant valvular heart disease, a history of cardiac surgery or catheter ablation or on class I/III antiarrhythmics were excluded.

Continuous ECG was recorded during at least 3 min at each of the three tilt-test protocol steps:

- Baseline (BL)
- Tilting backward -30 degrees (HDT)
- Standing +60 degrees (HUT)

Atrial fibrillation rate in fibrillations per minute (fpm) was estimated non-invasively using a frequency power spectrum analysis of QRS-cancelled ECG.

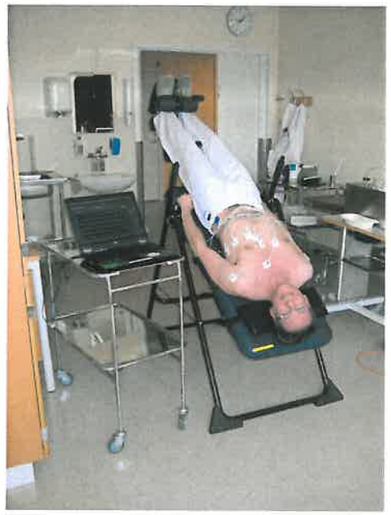

Figure 1 Frequency Analysis of Fibrillatory ECG (FAF-ECG) – method during HDT (head down tilt test) minus 30 degrees.

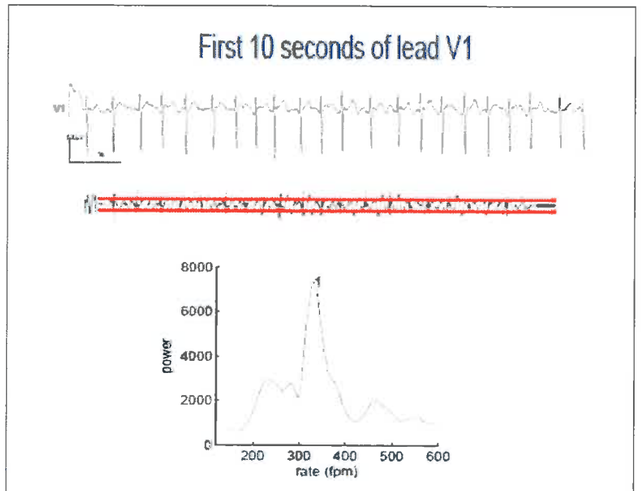

Figure 2 Frequency Analysis of Fibrillatory ECG (FAF-ECG) – Method. The QRS morphology is identified and then subtracted from the original ECG signal. The residual signal, representing the atrial activity undergoes spectral analysis. The peak frequency is identified and converted to a cycle length and an atrial fibrillatory rate.

Results

- HDT resulted in AFR decrease from mean 394 +/- 51 fpm at baseline to 380+/- 48 fpm (p<0,01; 20 of 22 patients showed reduction of AFR at HDT).
- HUT lead to AFR increase to 400+/-52 fpm (p=0,03; 19 of 22 patients increased AFR at HUT).

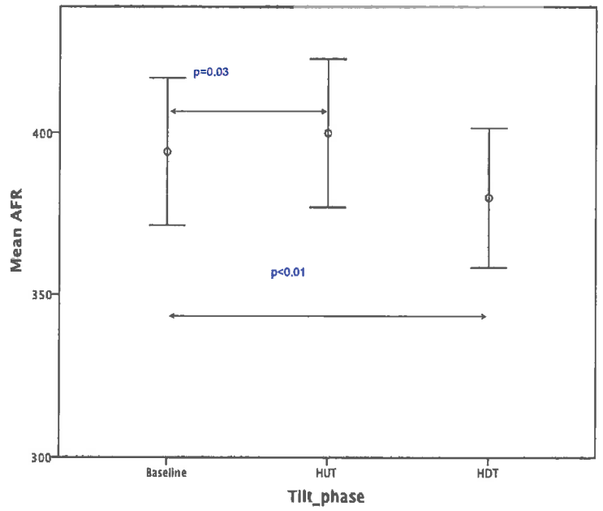

Figure 3 Results from Frequency Analysis of fibrillatory rate during baseline supine position, Head Down TILT and Head Up TILT.

Conclusions

Interventions on parasympathetic system during HUT and HDT result in significant changes in AFR, indicating that parasympathetic system modulation can affect electro-physiological properties of atrial myocardium during AF.

AFR slowing in patients with persistent AF during HDT that can potentially have cardioverting effect is a new observation, which warrants further research.

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