Tonic activation of peripheral chemosensory function modulates vagal heart rate control in heart failure patients with paroxysmal atrial fibrillation

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Background: Heart failure (HF) and atrial fibrillation (AF) are commonly associated and have both been mechanistically linked to changes in cardiac vagal control. The impact of peripheral chemosensors, residing in the carotid body, within this relationship between AF and HF has been only partially elucidated. We therefore investigated whether tonic activation of excitatory chemoreceptor afferents contributes to the altered vagal control in HF patients with a history of AF.

Methods and results: In 18 patients (72±9 y, 7male) with sinus rhythm and a history of AF (n=9, without any evidence of structural heart disease, AF group; n=9 with structural heart disease and clinical presentation of HF, AFHF group) we investigated the impact of chemosensory deactivation (by breathing 100% oxygen) on hemodynamics, oxygen saturation and breathing rate. 10 healthy controls served as a control group. In addition, we performed a deep breathing test demonstrating an impaired heart rate variation in patients without and with HF as compared to controls (Expiration/Inspiration difference: 23.9±6.9 vs 6.9±6.1bpm, and 23.9±6.9 vs 7.8±4.8bpm; p<0.05). In the control as well as the AF group heart rate decreased during chemoreceptor deactivation (control: -4.8±3.4%; AF: -5.1±3.0%; p<0.05), whereas heart rate did not change in AFHF patients. This resulted in an impaired cardiac chemoreflex sensitivity in AFHF patients (1.9±1.6 vs 0.5±1.2 ms/mmHg; p<0.05).

Conclusions: Our data suggest that tonic activation of excitatory chemoreceptor afferents contribute to a low vagal tone in heart failure patients with a history of AF.

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