

Abstract



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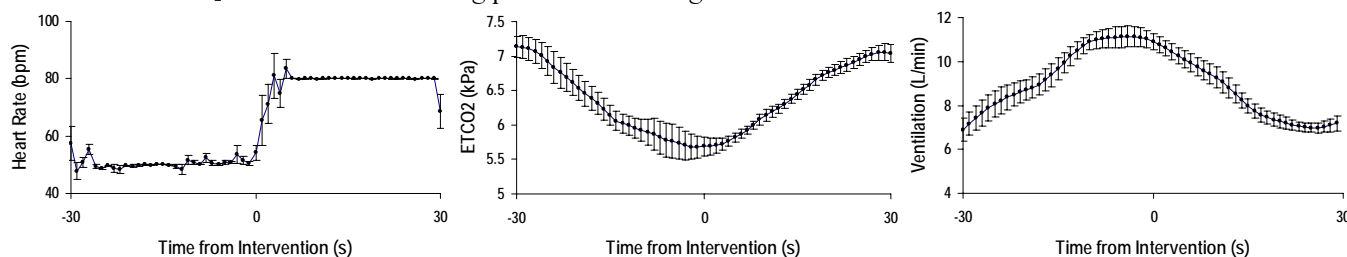
CAN YOU CONTROL VENTILATION WITH A CARDIAC PACEMAKER?

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Background Periodic breathing in chronic heart failure (CHF) results from unstable cardiorespiratory control, and is driven by oscillations in ventilation and CO₂. Using patients with pre-existing pacemakers, we tested the hypothesis that changes in cardiac output acutely affect the delivery of CO₂ into the lung, and therefore influence ventilation.

Method and Results We studied the effect of repeated alternations in heart rate of increment 30bpm (period 60s), on cardiorespiratory parameters in 21 subjects (12 subjects with CHF, 8 normals) with implanted pacemakers and stable breathing patterns. During intervention, both FETCO₂ and ventilation exhibited consistent sinusoidal oscillations with a period of 60s (FETCO₂ mean peak 4.16, trough 3.89; p<0.0001, ventilation mean peak 9.06 L/min, trough 7.44 L/min; p<0.0001). The mean amplitude of oscillations in FETCO₂ with intervention was 4.2 ± 2.6%, mean ventilation amplitude 12.4 ± 9.5%. The magnitude of oscillations in FETCO₂ generated correlated with the cardiac output increment produced from the intervention (r=0.56 p=0.0068).

Conclusions Cardiac output modulation using pacemakers can elicit consistent oscillations in CO₂ and ventilation in patients with stable cardiorespiratory control. The size of effect depends on the magnitude of the cardiac output response. This mechanism if appropriately harnessed and timed could potentially be therapeutic, counteracting the fluctuations in CO₂ and ventilation driving periodic breathing.



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