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Changes in respiratory-sympathetic coupling during hyperinsulinemia in healthy young adults

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Background: Breathing patterns can modulate the autonomic nervous system (i.e., respiratory-sympathetic coupling). A number of studies have demonstrated elevated muscle sympathetic nerve activity (MSNA) during hyperinsulinemic-euglycemic clamp conditions. Elevated systemic insulin also increases ventilation in healthy young adults; however, interactions between the two systems (i.e., respiratory-sympathetic coupling) during hyperinsulinemia have not been explored. The present investigation sought to examine the effect of hyperinsulinemia on respiratory-sympathetic coupling in humans.

Hypothesis: We hypothesized during high systemic insulin we would observe an increase sympathetic nervous system activity during late expiratory phase of the respiratory cycle (i.e., increased respiratory-sympathetic coupling) when compared to measures during baseline.

Methods: Twenty healthy young adults (13M/7F; 28$\pm$1 yrs) completed a single study visit. Heart rate (ECG), MSNA (microneurography of the peroneal nerve) and respiration (pneumotachometry) were measured continuously at baseline and during a 60-min hyperinsulinemic (1 mU/kg FFM/min), euglycemic infusion. Cardiac and respiratory modulation of MSNA was quantified at baseline and following insulin infusion by fitting polynomials to the cross-correlation histograms constructed between the sympathetic spikes and either ECG or respiration.

Expected Results: Insulin increased during the infusion ($p<0.01$) and glucose was maintained ($p>0.05$). Plasma epinephrine (47$\pm$5 to 61$\pm$6 mg/mL), norepinephrine (164$\pm$15 to 208$\pm$16), and MSNA (30$\pm$2 to 37$\pm$3 bursts/100 heart beats) were increased during the infusion ($p<0.05$). Although analysis is ongoing, we expect to observe an increase in respiratory modulation during hyperinsulinemia compared to baseline. We propose changes in the respiratory patterning of MSNA in the context of hyperinsulinemia will include more activity during late expiration and less activity during post-inspiration.