

Acute effects of exercise in heart failure patients

Clinical relevance

Heart failure occurs when the heart is unable to provide sufficient pump action to distribute blood flow to meet the needs of the body. Heart failure is a very common condition; about 5.8 million people in the United States suffer from it. Currently, heart failure has no cure. However, treatments—such as medicines and lifestyle changes—can help people who have the condition live longer and more active lives.

Background

Exercise training significantly improves symptoms and prognosis in heart failure. However, relatively little is known about the acute effects of such exercise bouts in heart failure. This is of special importance as one of the most important stimuli for vascular adaptations relates to the exercise-induced increase in vascular shear stress in the active and inactive regions. In peripheral conduit arteries, the blood flow pattern varies during one cardiac cycle. The large antegrade component during systole is followed by a retrograde component in early diastole. Antegrade shear is related to improvement in vascular function whilst the retrograde component is thought to exert a proatherogenic effect on the endothelium. Previous studies in healthy volunteers found that leg cycling exercise is associated with an increased retrograde flow in upper body arteries during the initial phase of which disappears when continuing exercise which coincides with an increase in skin temperature. As HF patients experience an enhanced sympathetic nerve activity and a disturbed thermoregulation, the reversal of the retrograde flow during exercise could be delayed. This different response can have important implications for the development of effective exercise training programs for HF patients. To our knowledge, no previous study performed a comprehensive comparison of the acute responses to exercise between healthy controls and heart failure patients.

Goals

In this internship we will compare brachial artery blood flow patterns during a moderate-intensity continuous exercise bout and a high-intensity interval exercise bout in heart failure patients and age- and sex-matched controls.

Techniques

We will measure brachial artery blood flow patterns continuously with echo-Doppler. Furthermore we will measure forearm skin temperature continuously using portable temperature monitors (iButtons) and core body temperature will be measured using an ingestible telemetric pill.

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