

Exercise training attenuates chemoreflex-mediated reductions of renal blood flow in heart failure

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In chronic heart failure (CHF), carotid body chemoreceptor (CBC) activity is increased and contributes to increased tonic and hypoxia-evoked elevation in renal sympathetic nerve activity (RSNA). Elevated RSNA and reduced renal perfusion may contribute to development of the cardio-renal syndrome in CHF. Exercise training (EXT) has been shown to abrogate CBC-mediated increases in RSNA in experimental heart failure, however, the effect of EXT on CBC control of renal blood flow (RBF) is undetermined. We hypothesized that CBCs contribute to tonic reductions in RBF in CHF, that stimulation of the CBC with hypoxia would result in exaggerated reductions in RBF, and that these responses would be attenuated with EXT. RBF was measured in CHF-sedentary (SED), CHF-EXT, CHF-carotid body denervation (CBD), and CHF-renal denervation (RDNX) groups. We measured RBF at rest and in response to hypoxia ($FIO_2 < 10\%$). All animals exhibited similar reductions in ejection fraction and fractional shortening as well as increases in ventricular systolic and diastolic volumes. Resting RBF was lower in CHF-SED (29 ± 2 ml/min) than in CHF-EXT animals (46 ± 2 ml/min, $P < 0.05$) or in CHF-CBD animals (42 ± 6 ml/min, $P < 0.05$). In CHF-SED, RBF decreased during hypoxia, and this was prevented in CHF-EXT animals. Both CBD and RDNX abolished the RBF response to hypoxia in CHF. Mean arterial pressure increased in response to hypoxia in CHF-SED, but was prevented by EXT, CBD, and RDNX. EXT is effective in attenuating chemoreflex-mediated tonic and hypoxia-evoked reductions in RBF in CHF. © 2015 the

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Carotid chemoreflex

Exercise training

Heart failure

Renal blood flow

adult

animal experiment

animal model

animal tissue

Article

carotid body chemoreceptor

chemoreceptor reflex

congestive heart failure

controlled study

denervation

echocardiography

exercise

heart ejection fraction

heart ventricle contraction

heart ventricle filling

hypoxia

kidney blood flow

kidney denervation

kidney perfusion

male

mean arterial pressure

nonhuman

priority journal

sympathetic nerve

animal

anoxia

arterial pressure

carotid body

disease model

heart contraction

heart failure

heart left ventricle function

heart stroke volume

innervation

kidney

kidney circulation

kinesiotherapy

pathophysiology

rabbit

reflex

time

vascularization

Animals

Anoxia

Arterial Pressure

Carotid Body

Denervation

Disease Models, Animal

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Heart Failure

Kidney

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Myocardial Contraction

Rabbits

Reflex

Renal Circulation

Stroke Volume

Time Factors

Ventricular Function, Left