

Abstract 2**Biofeedback in Heart Failure Patients
Awaiting Transplantation**

**Dana L. Frank, PhD; Matt Baumann, BS; Lamees Khorshid, PsyD;
Alex Grossman-McKee; Jerry Kiffer, MA; Wilson Tang, MD;
Randall C. Starling, MD; Michael G. McKee, PhD;
and Christine S. Moravec, PhD**

*Department of Cardiovascular Medicine and Department of Psychiatry and Psychology,
Bakken Heart-Brain Institute, Cleveland Clinic, Cleveland, OH*

Biofeedback training can be used to alter the balance of autonomic input to the cardiovascular system. Studies from our own group and others have shown that heart failure is accompanied by overactivation of the sympathetic nervous system, and that decreasing this activation (for example, with a beta-blocker or left ventricular assist device) not only has a positive impact on clinical status, but also reverses cellular and molecular alterations associated with the failing myocardium. In this study, we hypothesized that biofeedback-mediated stress management could also be used to remodel the failing myocardium in the direction of normal cardiac muscle function. A total of 20 patients with end-stage heart failure were studied, including four stable outpatients awaiting transplantation at home, who were studied in the Clinical Research Unit, and 16 inpatients

awaiting transplantation in the hospital, who were studied in their rooms. All patients were subjected to the same protocol, which included an initial assessment of physiologic reactivity to mental stress, six sessions of training with a certified biofeedback therapist, and a final assessment of physiologic reactivity to mental stress. Patients also completed the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) and Kansas City Cardiomyopathy questionnaires before and after the biofeedback protocol. A measurement of plasma norepinephrine and 6-minute walk distance were also collected at these times in outpatients only. At the time of heart transplantation, which occurred after the biofeedback training protocol, each explanted heart was obtained and transported to the laboratory. Trabecular muscles were dissected from the endocardial surface of the heart and hung in an oxygenated bath to study the inotropic response to sympathetic stimulation. Changes in developed tension were measured after exposing the muscles to isoproterenol, a synthetic norepinephrine analogue. Beta- adrenergic receptors on the myocardial cell membranes were also assessed by radioligand binding and Scatchard analysis. Data from this study demonstrate that biofeedback-mediated stress management training can decrease sympathetic nervous system activity and produce positive remodeling of the myocardium in patients with end-stage heart failure, similar to what has been previously observed for other more invasive therapeutic options.

* BHBI = Bakken Heart-Brain Institute