

Muscular CounterPulsation Pioneer

Larry Lapanashvili, MD, PhD, is the **award-winning researcher and cardiac surgeon** behind Cardiola's **breakthrough m.pulse®** device for treating CHF patients at home. . .



Chronic Heart Failure (CHF) is the most frequent cause of hospitalization in persons aged 65 years and older. 'Heart failure' describes when the heart is having difficulty completing its work. The term is not the same as 'heart attack', when the heart may stop; rather, heart failure involves a gradual ('chronic') breakdown of the heart. The concept of CounterPulsation to treat cardiac patients has been around for more than a half century. But Dr. Lapanashvili is the first researcher to be able to invent a noninvasive means that utilizes the patient's own muscles to facilitate circulatory support. He is the founder of Cardiola, and a cardiac surgeon at Marji Medical Center, Tbilisi, Georgia.

Georgian-born heart surgeon Larry Lapanashvili was conducting pioneering research in the field of *cardiomyoplasty* as far back as the eighties. This innovative procedure uses transplanted skeletal muscle wrapped around the heart or the aorta in order to aid cardiac output. In time, this method failed—mainly because, unlike heart muscle, skeletal muscles can fatigue during massive and continuous contraction. But the idea to use the body's own muscles, powerful enough to carry a runner over a marathon distance, was born. This concept led to the development of *Muscular CounterPulsation* (MCP), a technology that encompasses four aspects: (1) utilization of muscle contraction to influence the hemodynamic system of the body; (2) synchronization of these muscle contractions to certain phases of the heart cycle; (3) the specific signals used for muscle activation; and (4) system integration and design for at home application.

It is important to emphasize that MCP is a noninvasive technique to increase oxygen-rich blood flow to the heart and to reduce the heart's workload. Unlike *External CounterPulsation* (ECP), which uses pressure cuffs on the legs that are squeezed in sequences to force blood back to the heart, Dr. Lapanashvili chose a different approach: MCP electrically activates a patient's peripheral skeletal muscles in synchronization with their heartbeat. Muscles in the thigh and calf area are rhythmically contracted the instant the heart action phase called diastole begins. The fact that the muscle stimulation occurs in diastole, the "non-pulsing" phase of heart action, gave rise to the term of stimulation in "counterpulsation" mode. Synchronized muscle contractions typically alter the hemodynamics linked with the underlying principle of counterpulsation by reducing cardiac afterload. *With External CounterPulsation*, a patient must

make *daily visits* to a cardiologist's office. Dr. Lapanashvili's approach has made possible the development of *m.pulse®*—the world's first device that can be used *at home* by patients with CHF. One of the turning points in his scientific research occurred in 1991, when Dr. Lapanashvili received the *Alexis Carrel Award*, named for the Frenchman who won the Nobel Prize in Physiology or Medicine in 1912. The cash prize was \$3,000. "Back then it was a small *fortune*," he says. "Those were terrible times, when the Soviet Union collapsed. I am married and have two children. Four people living in Georgia at that time could live for a whole month on \$100. So \$3,000 was like winning the world's biggest lottery." Fortunately for CHF patients, the money allowed Dr. Lapanashvili to continue his groundbreaking research on MCP. □

