

Improved Cardiac Electrical Stability in Exercised Myocardial Infarct Rats with Left Ventricular Hypertrophy

Horesh Dor-Haim¹, Chaim Lotan¹, Michal Horowitz², Moshe Swissa³

¹ Cardiology Department, Cardiac Research Center, Hadassah Hebrew University,

² Physiology Department, Hebrew University, Jerusalem, ³ Cardiology Department, Cardiac Research Center, Kaplan Medical Center, Rehovot, Israel

Background: Aerobic training reduces the occurrence of sudden cardiac death, in patients with CHD. We hypothesized that prolonged training will alter heart substrate for arrhythmia, thus increase electrophysiological stability in myocardial infarct (MI) heart model.

Methods: Adult rats (n=30) were studied for 8 weeks. The first group (n=6) underwent LAD ligation to form MI and then trained on a treadmill for 8 weeks (TMI). A second intact group (n=8) was trained, as well, for 8 weeks (ITT). A third group (n=8) underwent LAD ligation was investigated under sedentary conditions (SMI) and a fourth sham operated group (n=16) was served as sedentary control (SCN). Eventually, EPS study was performed on the isolated Langendorff perfusion system.

Results: TMI Isolated trained hearts showed 3-fold improvement in their tolerance to the induction of ventricular fibrillation (VF) in comparison to SMI. ITT, TMI and SMI hearts were significantly hypertrophied compared to SCN (15%, 18% and 20% increase respectively $P < 0.01$). Effective refractory period (ERP) was significantly longer in SMI (39% increase $p < 0.001$), however was normal in TMI. Aerobic training has also improved in vivo stress test measurements and ECG parameters (QTC and HRV) of TMI in comparison to SMI.

Conclusion: This study demonstrates the electrophysiological protective effect of aerobic training on MI heart model. Training has normalized the MI adverse effect on cardiac electrophysiology, despite ventricular hypertrophy and structural remodeling of the heart. The improvement may be related to enhanced cardiac conductance and improved refractoriness induced by aerobic training.