Get the world on its feet: The role of exercise training

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Western societies are struggling to pay for their ever increasing medical budgets. In the US up to 393 billion US-$ were spent in 2005 for cardiovascular diseases alone. Based on epidemiologic studies in primary prevention it is reasonable to estimate that 30% of coronary heart disease and stroke could be prevented by 2.5 hours of brisk walking per week and approximately 284,886 cardiovascular deaths could be prevented per year in the US alone. With regard to metabolic disorders the figures are even more devastating: 91% of cases of diabetes type II may be attributed to high-risk behaviour including BMI>25, low fiber/high fat diet, sedentary lifestyle, and smoking.

In today's obesogenic environment regular physical exercise is more important than ever to reduce cardiovascular events. It does so (1) by modifying classical cardiovascular risk factors and (2) by direct shear stress-mediated effects on the vascular endothelium and on the release of vascular endothelial progenitor cells (EPCs). Data from epidemiologic studies are clear: ad 1) Regular physical exercise improves glycemic control and prevents the development of overt type diabetes in patients with pathologic glucose tolerance. On a molecular basis regular exercise increases the velocity of glucose uptake into the skeletal muscle which reduces glucose levels and improves insulin action. As hyperglycemia may induce endothelial dysfunction, an improved glycemic control is directly associated with improved vasoreactivity.

Regular exercise also reduces hypertension and hypercholesterolemia resulting in improved endothelial function. Ad 2) the most immediate

effect of exercise on the vascular endothelium is related to the intermittent increase in blood flow, which occurs necessarily during physical activities: Endothelial cells sense even minor increases in shear stress by the deformation of their cytoskeleton and of transmembrane proteins. In recent years our understanding of the biochemical pathways activated by increased shear stress has been greatly enhanced: Today we know that the expression and the activity of the nitric oxide (NO)-producing nitric oxide synthase (NOS) is increased and that detoxification of NO-degrading oxidative radicals is enhanced.

It is never too late to start exercising: Even in the presence of overt cardiovascular diseases (e.g. after acute myocardial infarction) endurance training will significantly increase your survival. As documented by meta-analysis of exercise interventions in stable coronary artery disease (CAD) cardiac mortality is reduced by one third. Among the mechanisms mediating the reduced cardiac event rate are improvement of endothelium-dependent vasodilation, reduced progression of coronary lesions, reduced thrombogenic risk, and improved collateralization.

Traditionally, training interventions were viewed as an adjunct therapy to routine interventional strategies in CAD. While this is certainly true for patients immediately post acute coronary syndromes, the prognostic benefit of percutaneous coronary interventions (PCI) is questionable among patients with stable CAD, in whom more than 50% of all interventions are performed.

Recent clinical trials compared exercise training to an interventional strategy in stable CAD patients. To investigators surprise, the 12 months exercise therapy was associated with a higher event-free survival as compared to conventional percutaneous coronary intervention. This result underscores that by treating the most significant lesion with PCI, the progression of atherosclerosis in other areas of the coronary tree is

left unaltered. Exercise, on the other hand, reduces plaque progression, improves endothelial function and collateral formation, and reduces thrombogenic risk in the entire vascular bed.

"Before time runs out, we must make physical activity and health education a number one priority of our public health system. Interventions need to start as early as in childhood, when unhealthy eating habits are coined and sedentary lifestyle is copied from adults" concluded Prof Hambrecht. "The degree to which unhealthy behaviour is regarded a 'private issue' must be publicly discussed. A balance needs to be struck between a reasonable minimum effort of the individual to reduce the healthcare costs and intrusion of an investigative healthcare system into personal lifestyle. The knowledge and the guidelines are there to support regular physical activity, the major issue is implementation."

Source: European Society of Cardiology (news : web)