Aerobical physical exercise effects on fibroelastic and collagen components of normotensive and hypertensive, sedentary and trained rats aorta

Tampelini, FS., Chaves, MLMB., Michelini, LC. and Chopard, RP.

Universidade de São Paulo

Arterial hypertension (AH) is known as a syndrome characterized by high blood pressure levels, caused by geometric, structural, morphological and functional changes on the arterial wall. Elastin and collagen are the most important components of blood vessels extracellular matrix, giving the necessary strength and elasticity to aorta. Structural changes on those components influence on AH, whereas non-pharmacological intervention, such as physical exercises, have been shown effective not only in reducing blood pressure, but also in bringing benefits for the entire cardiovascular system. As a consequence, the aim of this study was to evaluate the effect of aerobic exercises on morphological changes on abdominal aorta wall, in hypertensive and normotensive animals, sedentary (S) and trained (T). Spontaneously hypertensive rats (SHR) and normotensive Wistar Kyoto rats (WKY) were used on the experimental protocol that consisted in four groups divided in WKYS, WKYT and SHRS, SHRT. Trained groups were submitted to a training protocol that lasted 13 weeks, 5 hours an week, 1 hour a day. By the end of protocol, animals were sacrificed and aorta was removed for analyses. Results showed that physical exercises were effective not only in reducing blood pressure (165 ± 2 versus 172 ± 1 mmHg, $p < 0.05$), cardiac frequency (356 ± 8 versus 386 ± 9 bpm, $p < 0.05$) and wall-to-lumen ratio (0.063 ± 0.001 µm versus 0.071 ± 0.002 µm, $p < 00.5$) in SHRT when compared with SHRS, but also in increasing the number of elastic fibers (41 ± 1 versus 32 ± 1, $p < 0.05$) and the internal diameter (1045 ± 11 µm versus 961 ± 14 µm, $p < 0.05$) in SHRT when compared with SHRS. However, when comparing trained and sedentary normotensive groups, those modifications could not be seen. Concerning to collagen I and III distribution, although sedentary SHR showed only collagen I, which is responsible for the vessels stiffness, other experimental groups showed both collagens I and III (Figure 1). After quantitative analysis for collagen I and III, SHR presented a more accentuated proteins expression than WKY group. Moreover, trained SHR group showed a significant reduction on the both protein expression levels in comparison to the sedentary SHR (35% to collagen I and 49% to collagen III, respectively). Contrarily, the elastin expression levels were significantly decreased in SHR and the training promoted an increment on these levels in both groups SHR and WKY (61 and 79%, respectively). These results suggest that aerobic physical exercises were benefic to large vessels, due to morphological, geometric and constitutional changes on the wall, in the presence of a hypertension process.

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