Original Article

Effect of 10 Weeks of Continuous Aerobic Training on Tumor Volume and Gene Expression of IGF-1, Akt, and mTORC1 in the Myocardium of Mice with Breast Cancer

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Abstract

Introduction: Regular exercise training inhibits tumor growth and prevents cardiomyopathy in breast cancer patients by activating signaling pathways leading to changes in gene expression. The purpose of the present study was to investigate the effects of 10 weeks of continuous aerobic training on tumor volume and expression of IGF-1, Akt, mTORC1 genes in the myocardium of mice with breast cancer.

Methods: Twelve female BALB/c mice were divided into 2 groups of 6: Continuous Aerobic Exercise and Control. The tumor was induced by the injection of MC4-L2 cells. The aerobic exercise included 75 minutes of steady running at 60% to 65% of VO₂ peak, 5 days a week for 10 weeks. Tumor volume was measured by a caliper weekly. Twenty-four hours after the last training session, the mice were killed and their left ventricles were harvested. IGF-1 protein levels were measured with western blotting analysis, and real-time PCR was used to determine the expression of Akt and mTORC1 genes. The comparison of the groups was made using t tests at a significance level of 5%.

Results: IGF-1 did not show significant changes in the Aerobic Exercise group compared with the Control group (P = 0.08). The expression of Akt was significantly higher in the Aerobic Exercise group than in the controls (P = 0.016). The Aerobic Exercise group had also a significantly higher mTORC1 gene expression compared with the Control group (P = 0.022). Tumor volume also showed a significant decrease in the Aerobic Exercise group compared with the Control group (P = 0.03).

Conclusion: It can be concluded that 10 weeks of aerobic exercise training may reduce tumor volume and, possibly, improve heart function in breast cancer patients by increasing the expression of genes.

Keywords: Breast Cancer, Continuous Training, IGF-1, Akt, mTORC1