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Research of HIIT Detraining on Mitochondria of Soleus Muscle Beclin1 and Bnip3 Contents in Aging Rats

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Objective To observe the temporal variation of Beclin1 and Bnip3 protein in skeletal muscle aging degeneration by constructing the aged rat model, and to observe the effect of HIIT intervention on the changes of Beclin1 and Bnip3 protein and the relationship between the two. It provides a theoretical basis for the effect of exercise on the aging degeneration of skeletal muscle by affecting the level of mitochondrial autophagy.
Methods 40 male Wistar rats aged 8 months were randomly divided into quiet control group (C) and HIIT intervention group (H). After the rats entered the animal room for one week of adaptive feeding and exercise, the rats in the C group did not exercise, and the H group exercise alternately based on the maximum oxygen uptake test results of the rats with the 70%-90%-50%VO2max intensity. Once every two weeks, the maximal oxygen uptake of the rats in group H and group C was tested. Group H underwent 50min/ days, 5 days / weeks, and lasted for 16 weeks. The rats in the two groups were randomly selected after the first VO2 test and eighth and sixteenth weeks after intervention. After anesthesia, blood was collected from the abdominal aorta and soleus tissue was obtained. The ROS activity in soleus muscle was tested by fluorescence enzyme labeling method. Isolation of mitochondria from soleus muscle using tissue mitochondria Isolation Kit, and the expression of Beclin1 and Bnip3 in the mitochondria of the soleus muscle was tested by Western blot. The Image Lab 4 software was used to collect the data of the protein test strip, and the SPSS 17 software was used to analyze the data. The results of the data analysis were presented in the form of mean standard deviation. In the process of protein strip analysis, the relative value of the protein content of each sample was obtained by the gray scale analysis method. The results of the first sampling were taken as the baseline value, and the ratio of the H group in the C group of 8 weeks and 16 weeks was obtained with the baseline value, that is, the relative value of the protein content. Then, repeated measurement of variance analysis was used to analyze the differences of different indicators at baseline level, 8 weeks and 12 weeks between group C and group H. The independent sample T test was used without interaction effect, and multivariate analysis of variance was used. A significant level of alpha =0.05 is set.
Results (1) the content of ROS in skeletal muscle of rats was related to the process of natural aging ($F=119.314$, $P < 0.001$), and the level of ROS would rise with the process of natural collars ($F=28.884$, $P=0.001$; $F=127.607$, $P < 0.001$) through the comparison of the time points in the group C and the H group. At the same time, the level of ROS in group H was lower than that in group C, but there was no significant difference ($P=0.310$). And the interaction effect of time and exercise mode (HIIT) will not affect the result ($F=0.814$, $P=0.477$). But the growth rate of ROS in group H was lower than that in C group. ⑵Exercise, time change and their interaction did not affect the content of Beclin1 in rat skeletal muscle mitochondria ($P > 0.05$). ⑶The mitochondrial Bnip3 content in H group and C group was significantly different at 8 weeks ($F=14.500$, $P=0.001$), H group was significantly higher than that in C group, but there was no significant difference in mitochondrial Bnip3 content at the 16 week ($F=0.090$, $P=0.767$), and the Bnip3 content of skeletal muscle mitochondria changed with age ($F=20.852$, 0.001). The trend of H increased, but then decreased. There was a linear trend ($F=6.950$, $P=0.005$) between the level of mitochondrial Bnip3 content and the intergroup factors (time point changes) and the interaction between time and HIIT movement in rats.

Conclusions With the process of aging, (1) The content of ROS in skeletal muscle of rats increased significantly, while long-term HIIT training could delay the increase, but the best exercise time was unknown. (2) There was no obvious change in Beclin1 content in skeletal muscle mitochondria of rats, and HIIT training had no obvious effect on it. However, the changes in mitochondrial Beclin1 content relative to the total Beclin1 content of skeletal muscle need to be further studied; (3) The content of Bnip3 in skeletal muscle mitochondria in rats is increased, and long-term HIIT training has a delayed effect.