The effects of low-volume of physical activity and antioxidant supplementation on oxidised low-density lipoprotein in older adults

朴鍾煥
PARK, Jong-Hwan

研究指導教員： 中村 好男 教授
ABSTRACT

Blood lipid profiles, blood pressure, smoking status, and other conventional risk factors have long been considered in estimating an individual’s cardiovascular disease risk. However, these conventional cardiovascular disease risk factors might only be explaining half of cardiovascular disease cases. Thus, the search began for novel risk factors that might help provide a more complete picture of a person’s cardiovascular disease risk. Among the most promising novel risk factors recently linked to cardiovascular disease are oxidised low-density lipoprotein and oxidative stress markers.

It has shown benefits of physical activity on cardiovascular disease risk markers in both general and disease-specific populations of older adults. Although there are numerous sources of evidence that regular physical activity is beneficial for health, most individuals do not complete a sufficient amount of physical activity to meet the guidelines set out by expert panels. In addition, a minimum dose of physical activity associated with reduced cardiovascular disease risk markers is not clear in older adults. In addition to exercise, vitamin E supplementation has been shown to reduce oxidative stress and cardiovascular disease risk in older adults, and when combined exercise and/or vitamin E, there is evidence suggesting that they act synergistically.

Therefore, the aim of this thesis is to examine the relationship between physical activity status and oxidised low-density lipoprotein concentrations. Additionally this thesis main investigates the effects of low-volume physical activity on oxidised low-density lipoprotein and other cardiovascular risk markers in older adults. Finally, the aim of this thesis is to determine whether antioxidant supplementation (vitamin E) and low-volume physical activity is attenuated oxidative stress and oxidised low-density lipoprotein in older adults.

The first study examined the relationship between the amount of physical activity and oxidised low-density lipoprotein in older adults. The results showed that fasting plasma oxidised low-density lipoprotein concentrations and plasma monocyte chemoattractant protein-1 concentrations were negatively correlated with the amount of physical activity. This study demonstrates that regular physical activity may provide a protective role for the oxidation of low-density lipoprotein in older adults.
The second study aimed to determine the effects of a 12-week of walking programme below the current minimum physical activity recommendation on cardiovascular disease risk markers in older adults. The results showed that plasma oxidised low-density lipoprotein concentrations tended to be decreased in the walking group after 12 weeks compared with the baseline values. The ratio of oxidised low-density lipoprotein to high-density lipoprotein cholesterol were significantly decreased in the walking group after 12 weeks compared with the baseline values. Blood pressure and serum high-density lipoprotein cholesterol concentrations were significantly improved in the walking group after 12 weeks compared with the baseline values. These findings demonstrate that a small volume of 12-week walking programme confers a benefit to cardiovascular-related health in older adults.

The final study investigated the effects of 12 weeks of participation in a low-volume walking exercise programme combined with daily vitamin E supplementation on thiobarbituric acid reactive substances (a marker of oxidative stress) and oxidised low-density lipoprotein concentrations in older adults. One-factor ANOVA revealed no between-group differences in plasma oxidised low-density lipoprotein concentrations. However, concentrations of plasma thiobarbituric acid reactive substances were significantly lower in the walking group, walking+supplement group and supplement group relative to the control group at the end of the study period.

In conclusion, the studies described in this thesis show that low-volume physical activity and/or vitamin E supplementation was not effective for reducing plasma oxidised low-density lipoprotein concentrations. However, a 12 week of walking programme equivalent to an amount of exercise below the current minimum recommendation in older adults may improved the ratio of oxidised low-density lipoprotein to high-density lipoprotein and cardiovascular disease risk markers such as blood pressure, high-density lipoprotein cholesterol. Furthermore, another key finding of the studies reported here is that low volume of physical activity and/or taking vitamin E supplementation attenuated plasma concentrations of thiobarbituric acid reactive substances in older adults.

Therefore, these finding of this thesis imply that low volume of physical activity and/or taking vitamin E supplementation can be a preventive intervention strategy for improving cardiovascular disease risk markers. In particular, this may apply to older adults with low fitness levels and/or sedentary lifestyle.