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Editorial

Carotid Artery Parameters After Combined Exercise Training in Women with Sarcopenic Obesity

Yuko Gando

Department of Physical Activity Research, National Institute of Health and Nutrition, NIBIOHN, Tokyo, Japan

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Aging is associated with changes in the structure of elastic arteries (intima-media thickening and luminal dilation). This type of remodeling is an adaptive process that occurs in response to long-term changes in hemodynamic stimuli, but is believed to contribute to the pathophysiology of vascular diseases and circulatory disorders. It is well known that carotid artery intima-media thickness (IMT) is a surrogate marker for atherosclerosis[1] and an independent risk factor for cardiovascular disease[2].

A combination of both conditions is defined as sarcopenic obesity and is more closely associated with traditional risk factors for cardiovascular diseases and increasing carotid IMT, rather than either obesity or sarcopenia alone. Regular resistance exercise increases appendicular skeletal muscle mass and aerobic exercise is effective in decreasing cardiovascular disease risk. Therefore, combined complex resistance and aerobic exercise is desirable. It remains unclear whether a regular exercise program in older women positively modulates carotid IMT. In particular, the effect of a combined exercise program on carotid artery parameters in older women with sarcopenic obesity is unknown.

Park *et al.*[3] tested the hypothesis that combined exercise training would reduce the progression of carotid IMT in women with sarcopenic obesity. The investigators selected 50 women with sarcopenic obesity (age 65−84 years) from among 350 participants. The 50 subjects were randomly divided into a control group ($n=25$) and a supervised exercise program group ($n=25$). The 24-week combined aerobic and resistance exercise program consisted of sessions lasting 50−80 min, 5 days per week. Resistance exercise was performed with elastic bands for 12 items (elbow flexion, wrist flexion, shoulder flexion, lateral raise, front raise, chest press, reverse flies, side band, dead lift, squat, leg press, and ankle plantar flexion), 8−15 repetitions per set (in weeks 1−12, 8−11 repetitions per set; in weeks 13−24, 12−15 repetitions per set), 2−3 sets (1-min rest between sets), 20−30 min per session, and 3 days per week. Aerobic exercise involved various walking activities (sideways, backward walking, and slow or fast indoor walking) for 30−50 min per session, 5 days per week, with a rating of perceived exertion in the 13−17 range.

The 24-week combined exercise program decreased carotid IMT in older women with sarcopenic obesity. In addition, the program increased peak systolic flow velocity and wall shear rate.

A systematic review and meta-analysis of four randomized controlled trials that evaluated the effects of aerobic exercise on carotid IMT demonstrated no reduction in IMT[4]. Moreover, carotid IMT was not affected by resistance exercise[5]. On the other hand, a recent intervention study by Byrkjeland *et al.*[6] demonstrated that combined exercise training effectively decreases carotid IMT in high-risk individuals with combined type 2 diabetes and coronary artery disease. Subjects included in the present study were elderly women with sarcopenic obesity, which is a risk factor for cardiovascular disease and disability in the elderly. The study results indicate that 6 months of combined exercise effectively decreases carotid IMT in elderly women with a combination of low skeletal muscle and high body fat mass. This suggested that the effects of combined exercise on carotid IMT will appear in a limited group of subjects.

A recent review of exercise training and atherosclerosis reported that the decrease in carotid IMT with exercise training is associated with increased cyclic blood pressure, shear stress, and antioxidant defense and decreased inflammatory processes, vascular tone,

Address for correspondence: Yuko Gando, National Institute of Health and Nutrition, NIBIOHN, Department of Physical Activity Research, 1-23-1 Toyama, Shinjuku, Tokyo, 162-8636, Japan
E-mail: gando-y@nibiohn.go.jp
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and sympathetic nervous system activity[7]. Another review reported that increased physical activity suppresses the overall cardiovascular disease risk and slows the progression of carotid atherosclerosis[8]. The association between exercise and decreased carotid IMT presented in the two reviews is a potential mechanism for the observed decrease in carotid IMT with combined exercise in this study. The mechanism for changes in the large artery flow velocity is not clear. Park *et al* suggested that the improvement of cardiac function with combined exercise training contributes to the increase in carotid artery flow velocity. Recent report demonstrated that lower carotid wall shear stress was associated with a higher plaque burden in the carotid arteries[9]. Therefore, increased carotid artery flow velocity and wall shear rate by combined exercise are considered to have additive benefit for cardiovascular disease prevention.

In conclusion, this was the first study to determine the effects of a 24-week combined exercise program on carotid IMT and flow velocity in older women with sarcopenic obesity. Further studies are needed to reproduce and validate these findings in various populations with larger sample sizes.

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