

Impact of Regular Exercise on Arterial Stiffness and Cerebral Blood Flow in Adults

Kyung Yae Hyun¹, Kyung Mo Oh², Min Kyung Lee³, Seong Ja Seok⁴, Hwa Sik Choi⁵, and Seok Cheol Choi^{6†}

¹Dept. of Clinical Laboratory Science, Dong-Eui University, Busan 614-714, Korea, ²Dept. of Physical Education, Pukyong National University, Busan 608-737, Korea, ³Dept. of Dental Hygiene, Dong-Eui University, Busan 614-714, Korea, ⁴Dept. of Clinical Pathology, Sorabol College, Gyeongju 780-711, Korea, ⁵Department of Clinical Laboratory Science, Shinheung College, Uijungbu, 480-701, Korea, ⁶Dept. of Clinical Laboratory Science, Catholic University of Pusan, Busan 609-757, Korea,

†, corresponding author, E-mail: scchoi@cup.ac.kr

Abstract. We investigated impacts of regular exercise on the arterial stiffness, cerebral blood flow, and peripheral nerve test. The body weight, systolic blood pressure, and stiffness degree of arteries was lower, whereas cerebral blood flow velocity was higher in the exercise group than in the control group. These findings indicate that exercise may provide useful impacts on peripheral vessels and cerebral circulation.

Keywords: Regular exercise, Blood pressure, Arterial stiffness, Cerebral blood flow

1 Introduction

Despite the beneficial effects of exercise (PiePoli et al., 2004; Bassuk and Manson, 2005; Roberts and Barnard, 2005), several studies have found that exercise may induce damaging effects such as acute coronary syndrome (Willich et al., 1993), increased platelet and leukocyte activations, elevated platelet-leukocyte aggregations, and facilitation of thrombogenesis (Li et al., 2007). Additionally, exercise may cause increased stress-induced shear force, and promote platelet and coagulation system activation, catecholamine release (Ikarugi et al., 1999). There has been argument on the physiological effects of exercises. Besides, studies for the effects of exercise on the arterial stiffness and cerebral blood flow were relatively few. We investigated the effects of regular exercise on the arterial stiffness and cerebral blood flow in adults.

2 Materials and Methods

One hundred-twenty healthy volunteers (age thirties-sixties) were participated in this study and were divided nonexercise (control, n=60) and exercise group (n=60). The exclusive criteria were people with recently surgery, diabetes, neuromuscular disorders, cardiovascular and cerebrovascular diseases, or respiratory diseases. This study was accepted from IRB of the Catholic University of Pusan. Systolic and diastolic blood pressure were measured in study population. Middle cerebral artery blood flow velocity was measured by transcranial Doppler. Stiffness of aorta, arm and leg artery was measured by PP-2000 module. Unpaired *t*-test was applied for comparison of all variables between two groups. Statistical significance was accepted with $P < 0.05$.

3 Results

The mean body weights were lower in the exercise than in the control group (Table 1). There was no significance in the other parameters between two groups. SBP, stiffness degree of aorta, stiffness of degree of upper artery and stiffness of degree of lower artery were lower in the exercise group than in the control group (Table 2). Middle cerebral artery blood flow velocity was higher in the exercise group than in the control group (Table 3).

4 Discussion

Regular exercise can prevent increase of body weights, leading to reduced prevalence of adult disease and metabolic syndrome. An exercise program applied in this study may be promise decreased body weights and BP, prevention of arterial stiffness and elevated cerebral artery blood flow.

Table 1. Characteristics of control and exercise groups

Variable	Group	
	Control (n=60)	Exercise (n=60)
Age (years)	47.41±15.75	45.80±16.71
Gender (M : F)	43 : 17	39 : 21
Height (cm)	167.75±13.20	166.42±14.05
Body weight (kg)	74.20±14.12	66.16±13.00**
Smoking (piece/day)	6.70	5.96
Drinking (16.9%/w)	3 bottle/2.50 time	3 bottle/2.61

Data were expressed the mean±standard deviation (SD). **, $P<0.01$ (compared with the control group). Abbreviation: w, week.

Table 2. Comparison of arterial stiffness between two groups

Variable	Group	
	Control (n=60)	Exercise (n=60)
SBP (mmHg)	126.06±15.97	116.92±16.20**
DBP (mmHg)	74.29±11.82	74.13±10.75
SDA (degree)	1.59±0.05	1.32±0.02*
SDUP (degree)	1.76±0.03	1.57±0.01*
LDUP (degree)	1.78±0.03	1.68±0.02*

Data were expressed the mean±SD. *, $P<0.05$; **, $P<0.01$ (compared with the control group). Abbreviation: SBP, systolic blood pressure; DBP, diastolic blood pressure; SDA, stiffness degree of aorta; SDUP, stiffness degree of upper artery; LDUP, stiffness degree of lower artery.

Table 3. Comparison of cerebral blood flow between two group

Variable	Group	
	Control	Exercise
MCA (cm/s)	54.3±12.30	63.95±13.67*

Data were expressed the mean±SD. *, $p<0.05$. Abbreviation: MCA, middle cerebral artery.

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