Effect of endurance and strength exercise on release of brain natriuretic peptide

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ABSTRACT

Objectives: The aim of this study was to investigate the effects of 8-week endurance and resistance exercise training on release of brain natriuretic peptide. **Materials and Methods:** Study population was categorized into 4 groups: Group-1 (n = 6) consisted of sedentary individuals who volunteered to complete 8-weeks of endurance exercise; Group-2 (n=6) consisted of sedentary individuals who volunteered to complete 8-weaks of resistance exercise. Three blood samples [for Terminal pro BNP (NT-Pro-BNP)] were taken before, immediately after exercise and after 8 weeks of exercise training. **Results:** NT-Pro BNP was significantly increased immediately after endurance exercise [from 37.9 ± 1.4 pg/ml to 52.1 ±1.5 pg/ml; $P = 0.002$] and was decreased to 23.2 ± 9.3 pg/ml after 8 weeks of endurance exercise [$P = 0.013$]. On the other hand, NT-Pro BNP showed no significant changes immediately after resistance exercise [from 26.6 ± 4.9 pg/ml to 24.1 ±4.5 pg/ml; $P = 0.553$]. In contrast, NT-Pro BNP was significantly increased to 39.5 ±1.6 pg/ml after 8 weeks of resistance exercise [$P = 0.012$]. **Conclusion:** Endurance exercise training reduces circulating NT-Pro BNP concentration, which is likely a marker of reduced ventricular wall tension and improved myocardial function. In contrast, strength exercise induces significant increase in NT-Pro BNP, which could be partially attributed to myocardial damage.

Key words: Brain natriuretic peptide, endurance exercise, strength exercise

INTRODUCTION

Brain natriuretic peptide (BNP) is principally synthesized and released by ventricular myocytes in response to myocardial wall stress.[1-3] BNP is then cleaved into N-Terminal pro BNP (NT-Pro BNP).[2] Both BNP and NT-Pro-BNP are detectable in the blood by several commercially available assays and have been found to have prognostic and diagnostic values in systolic and diastolic heart failure, acute coronary syndromes and stable coronary artery disease.[4-8] The aim of this study was to investigate the effects of 8-week endurance and resistance exercise training on NT-Pro BNP release. We also investigated the effect of androgenic anabolic steroid abuse on NT-Pro BNP release.

Access this article online	
Quick Response Code:	Website: www.jcdronline.com
	DOI: 10.4103/0975-3583.91599

MATERIALS AND METHODS

Study population

Study population was categorized into 4 groups: Group-1 (n = 6) consisted of randomly-selected sedentary individuals who volunteered to complete 8-weeks of endurance exercise; Group-2 (n = 6) consisted of randomly-selected sedentary individuals who volunteered to complete 8-weeks of resistance exercise; Group-3 (n = 5) consisted of bodybuilders who denied any current or previous use of anabolic androgenic steroids; Group-4

(n = 5) consisted of bodybuilders who were regularly using anabolic androgenic steroids for at least one month prior to the start of the study. All subjects were normotensive (blood pressure < 140/90 mmHg). The subjects of the research were all free of cardiovascular and pulmonary disease, alcohol use, and diabetes mellitus; and, were not taking any kind of medications and did not present with any abnormal electrocardiographic patterns. Each subject provided informed written consent. The study was approved by the university ethics committee.

N-Terminal Pro Brain natriuretic peptide measurement

Three blood samples (for NT-Pro BNP) were taken before, immediately after 35 minute exercise and after 8 weeks of exercise training.

Endurance exercise training protocol

The following exercise plan was designed: 1-Warm up (5 minutes of light treadmill walking at a power of 15 Watt); 2-High impact treadmill run (exercise rate subsequently increased by 10 W/min, Total time = 20 minutes); 3-Cool down (10 minutes). NT-Pro BNP was checked before and immediately after 35 minutes of exercise. After becoming familiar with the testing equipment, regular aerobic exercise three times a week for 45 minutes was performed by the subjects, and the NT-Pro BNP levels were checked after 8 weeks of exercise.

Resistance exercise training protocol

This consisted of two sessions, one using resistance machines (15 minutes) and the other isometric exercises and dumbbells (20 minutes). NT-Pro BNP was checked before and immediately after 35 minutes of exercise. After becoming familiar with the testing equipment, resistance exercise three times a week for 30 minutes was performed by the subjects, and the NT-Pro BNP levels were checked after 8 weeks of resistance exercise.

Statistical analysis

All values are presented as mean ± Standard Deviation. Comparisons within groups were made using paired *t*-test and one-way analysis of variance (ANOVA). For all analyses, *P*-value < 0.05 was considered as statistically significant.

RESULTS

Baseline characteristics

Table 1 shows the baseline characteristics of the study population.

Effects of different exercise training on N-Terminal Pro Brain natriuretic peptide

NT-Pro BNP was significantly increased immediately after endurance exercise (from 37.9 ± 1.4 pg/ml to 52.1 ±1.5 pg/ml; $P = 0.002$) and was decreased to 23.2 ± 3.4 pg/ml after 8 weeks of endurance exercise ($P = 0.013$). On the other hand, NT-Pro BNP showed no significant changes immediately after resistance exercise (from 26.6 ± 4.9 pg/ml to 24.1 ±4.5 pg/ml; P=0.553). Further, NT-Pro BNP was significantly increased to 39.5 ±1.6 pg/ml after 8 weeks of resistance exercise ($P = 0.012$) [Figure 1]. One-way ANOVA analysis showed that resistance exercise had

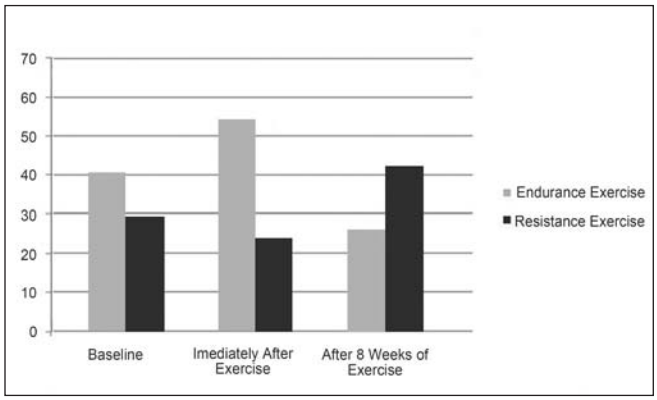

Figure 1: Effects of different exercise training on N-Terminal Pro Brain natriuretic peptide (NT-Pro BNP). NT-Pro BNP was significantly increased immediately after endurance exercise [from 37.9 ± 1.4 pg/ml to 52.1 ±1.5 pg/ml; P=0.002] and was decreased to 23.2 ± 3.4 pg/ml after 8 weeks of endurance exercise [P = 0.013]. On the other hand, NT-Pro BNP showed no significant changes immediately after resistance exercise [from 26.6 ± 4.9 pg/ml to 24.1 ±4.5 pg/ml; P = 0.553]. In contrast, NT-Pro BNP was significantly increased to 39.5 ±1.6 pg/ml after 8 weeks of resistance exercise [P = 0.012]

Table 1: Baseline characteristics of the study population

	Group-1 (n=6)	Group-2 (n=6)	Group-3 (n=5)	Group-4 (n=5)
Age (years)	54±11.2	57±11.5	24.2±2.5	23±2.2
Weight (kg)	75±6.8	68±7.5	80±6.9	89.8±6.5
Height (cm)	180±9.5	167±6.3	176±5.8	177±5.5
Body mass index (kg/m^2)	23.1±1.8	24.3±2.2	25.8±2.5	28.3±2.6*

*$P = 0.034$