

The Evaluation of the Effect of 12 Weeks of Water Aerobic Exercise and Atrovastatin Drug on Apolipoproteins A1 Changes, ANP, BNP and CRP in Older Men with Cardiovascular Diseases

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Abstract

Background. The aim of this study is to investigate the effect of 12 weeks of water aerobic exercise and atorvastatin drug on apolipoproteins changes A1, ANP, BNP and CRP in older men with cardiovascular diseases.

Methods. In this study, we chose 40 patients with cardiovascular disease that were divided into four groups. Experimental groups selected exercise 3 times per week during 3 months with the method of walking on the water and carnal swimming.

Results. The results were expressed as the mean $\pm$ sd, and all statistical comparisons were made by means of a one-way ANOVA test, followed by Tukey's Post-Hoc analysis.

Conclusion. The effect of exercise and intervention taking Atorvastatin increased Apolipoproteins A1 changes, but reduced ANP, BNP, and CRP, followed by the reduction of disease cardiovascular and improve cardiovascular function. *Clin Ter 2022; 173 (4):362-368 doi: 10.7417/CT.2022.2447*

Key words: Aerobic Exercise, Atorvastatin, Cardiovascular Disease

Introduction

Cardiovascular diseases are regarded as one of the most important causes of morbidity and mortality, especially in more developed countries, accounting for nearly 40% of deaths in the world each year. Due to the sedentary lifestyle, cardiovascular disease has increased in recent decades (1). Sedentary lifestyle has involved more and less developed countries, which in turn leads to increasing incidence of cardiovascular disease and early mortality (2, 3). Dyslipidemia is accompanied by low HDL and high LDL, leading to cardiovascular diseases (4). Coronary artery disease is considered as one of the most common kind of heart disease - vessels. This disease may impair cardiac function and ultimately causes

heart attack (5). The combination of statin drugs and regular exercise give rise to increasing lipoproteins (HDL). Natriuretic heart peptides include Peptide (ANP); Brain Natriuretic Peptide (BNP); C-type Natriuretic Peptide (CNP), which play an important role in regulating heart function (6). Natriuretic heart peptides have vasodilatory effects, which contribute to reduction in circulating blood volume, arterial pressure, central venous pressure and cardiac output (7, 8). Some researches have shown that physical activity after heart attack causes enhancing potentially beneficial effects of statin therapy (9). In addition, the combination of atorvastatin and exercise can have synergistic effect on the composition and stability of atherosclerotic plaques and that the impact of exercise as a treatment plays a leading role in the prevention of cardiovascular disease (10). Nowadays, many researchers are paying more attention to a high-sensitivity C-reactive protein (hs-CRP), as a sensitive, independent and strong indicator in the inflammatory so that increasing in this indicator would be with cardiovascular diseases (11, 12). As a consequence, any action that reduces this inflammatory marker, contributing to decrease in cardiovascular diseases (13). The choice of type of exercise in this study is aerobic exercise, so similar to the study of C. Cilindro et al in 2019 with this study (14). Since the role of inflammation in the pathogenesis of cardiovascular disease may be one mechanism to reduce heart disease, so we aimed to evaluate the effect of 12 weeks of water aerobic exercise and atorvastatin drug on apolipoproteins changes A1, ANP, BNP and CRP in older men with cardiovascular diseases.

Method and Material

This study was conducted in Shiraz hospitals at Shiraz University of Medical Sciences. We chose 40 patients with cardiovascular disease that were divided into four groups. All characteristics of the patients, experimental groups and

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therapeutic protocols are summarized in Table 1, 2 and 3. In this study, high, weight, blood pressure, hear rate and BMI were measured with standard method. More importantly, Serum samples were obtained from blood patients to deter-

mine levels of apolipoproteins changes A1, ANP, BNP and CRP send Shiraz laboratory. In the end, the results of the experiments are represented as the mean±standard deviation (SD). Data were analyzed using ANOVA with $P \leq 0.05$.

Table 1.Characteristics of the patients

Number of patients	40
Gender	Male
Without smoking	40
Without drinking Alcol	40
Cardiovascular disease with coronary artery disease	40

Table 2. Therapeutic protocols

Weak	Repeat	Maximal heart rate	Kind	Time
1th	3 times per weak	55-60%	Walking on the water and Carnal swimming	10 mintues warming 15 mintues activity 5 mintues cooling
3th	3 times per weak	55-60%	Walking on the water and Carnal swimming	10 mintues warming 23 mintues activity 5 mintues cooling
6 th	3 times per weak	55-60%	Walking on the water and Carnal swimming	10 mintues warming 32mintues activity 5 mintues cooling
9 th	3 times per weak	55-60%	Walking on the water and Carnal swimming	10 mintues warming 41 mintues activity 5 mintues cooling
12 th	3 times per weak	55-60%	Walking on the water and Carnal swimming	10 mintues warming 50 mintues activity 5 mintues cooling

Results

As can be seen in Table (3), see pre-test and post-test performance information this study were divided into four experimental groupspractice, Atorvastatin.

There was no significant difference between the C-reactive protein practice and atorvastatin groups ($p = 0.845$) and that also there was no significant difference between

Table 3. Four experimental rroups

P value	Contral group		Atorvastatn groups		Practice and Atorvastati ngroups.		Experimental group		Group Phase	
	SD	Mean	SD	Mean	SD	Mean	SD	Mean		
0/589	0/11	0/73	0/09	0/79	0/12	0/81	0/31	0/84	pre-test	Hs-CRP (Mg/dl)
0/000	0/10	0/77	0/22	0/55	0/14	0/41	0/12	0/61	post-test	
0/918	8/61	106/27	7/58	148/105	9/00	190/103	6/30	164/104	pre-test	BNP (Mg/dl)
0/000	8/56	105/31	5/43	94/62	7/18	81/93	6/05	90/84	post-test	
0/705	7/29	82/13	6/80	83/67	6/41	85/41	5/35	82/86	pre-test	ANP (Mg/dl)
0/000	7/69	80/50	6/69	70/66	4/69	64/61	4/15	74/92	post-test	
0/504	8/52	57/23	18/45	50/80	10/52	57/60	9/46	58/35	pre-test	APO-AI (Mg/dl)
0/000	8/02	56/35	7/63	82/25	11/65	97/15	11/31	75/17	post-test	

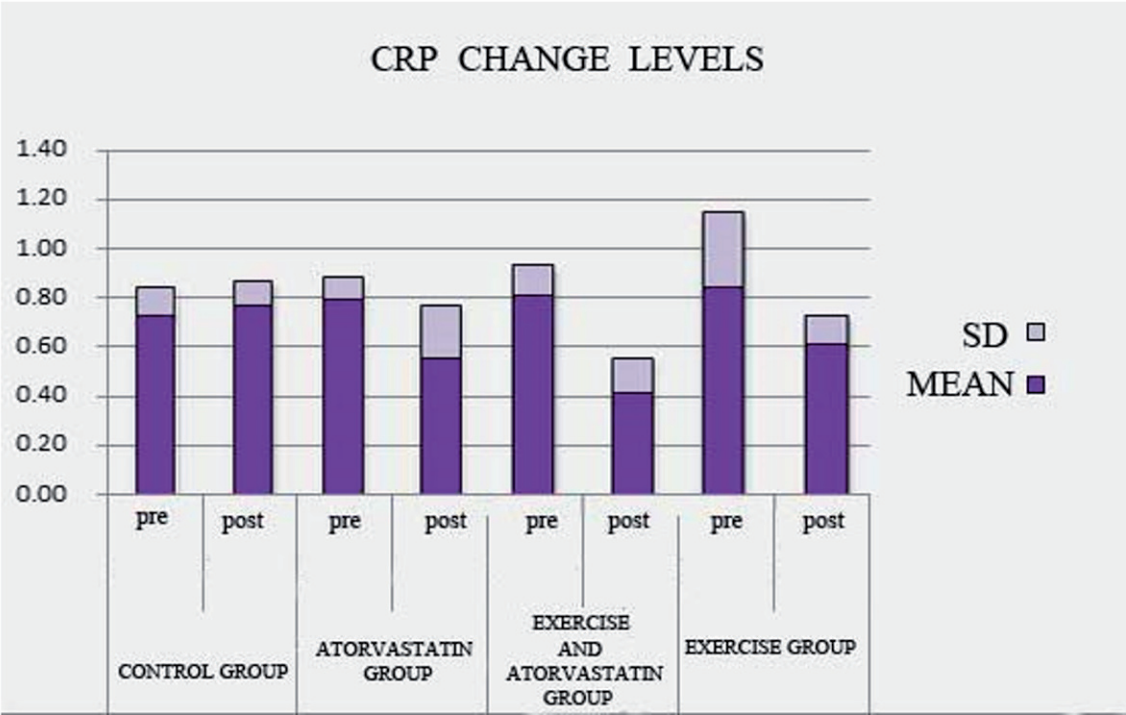


Fig.1. The mean rate of change in hs-CRP participants before and after exercise

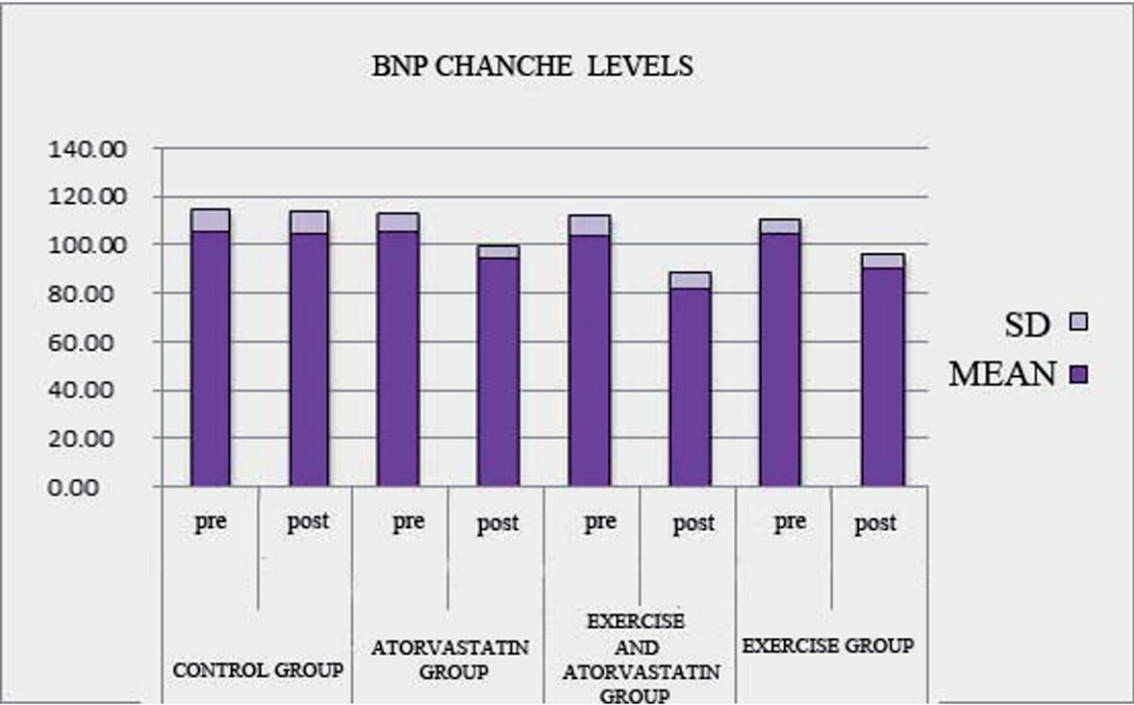


Fig. 2. The mean rate of change of BNP subjects before and after exercise

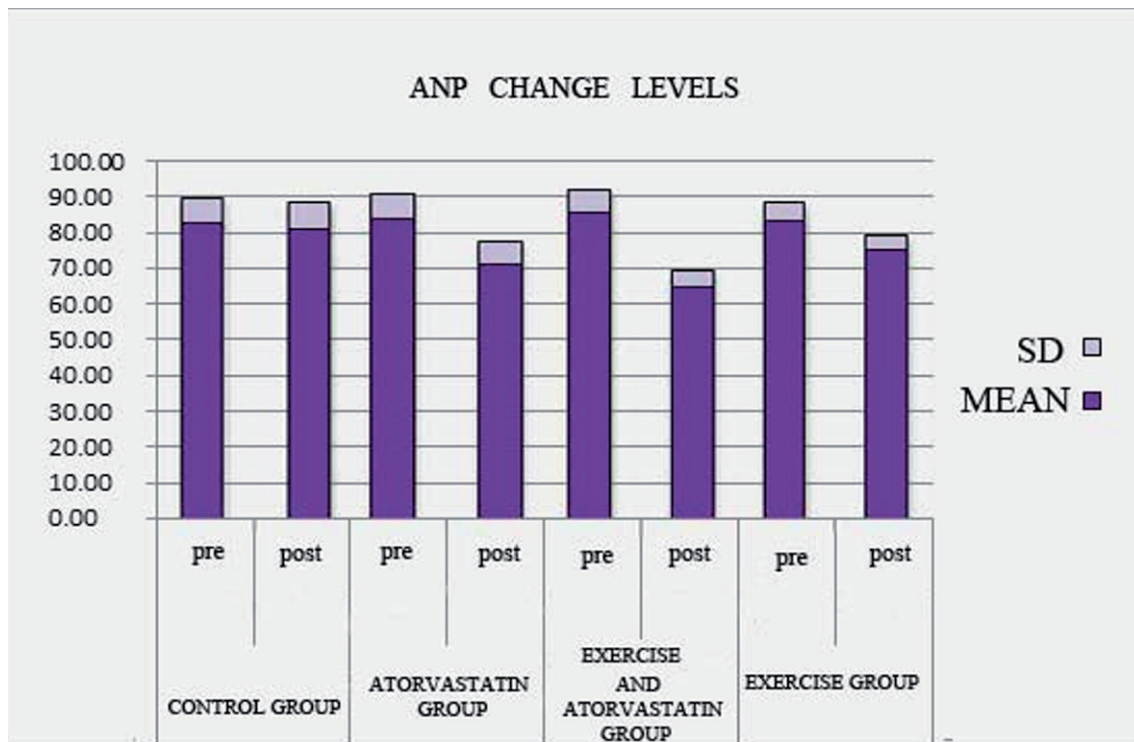


Fig.3. Mean and standard deviation ANP changes the subjects before and after exercise

the average C-reactive protein and exercise and the control groups ($p = 0.127$). Moreover, there was no significant difference between the mean C-reactive protein practice group and atorvastatin with atorvastatin. However, there was a significant difference between C-reactive protein and atorvastatin training groups and the control group ($p = 0.0001$). Furthermore, there was a significant difference between the C-reactive protein atorvastatin and the control groups ($p = 0.020$). In addition, there is a significant difference of Atorvastatin on BNP changes.

As can be seen, there is a significant difference between BNP practice and the control groups ($P = 0.000$) and as well as that there was a significant difference between BNP of practice - atorvastatin with atorvastatin groups ($P = 0.001$), but no significant difference was found between BNP practice - atorvastatin with the control groups. There was a significant difference between the BNP atorvastatin and the control groups ($p = 0.007$), so between the effect of a period of 12 weeks of aerobic exercise in the water and Atorvastatin on changes ANP was observed.

There was a significant difference between atrial natriuretic peptide exercise group with atorvastatin group ($P = 0.369$) and that also there was no significant difference between the ANP in the training and the control groups ($P = 0.178$). Moreover, there was no significant difference between ANP in training group - atorvastatin with atorvastatin ($p = 0.1270$). In addition, there was a significant difference between ANP in atorvastatin and the control groups ($p = 0.004$). So there is a significant difference between the effect of a period of 12 weeks of aerobic exercise in the water and the fluctuation of Apo-A1 Atorvastatin.

There was significant difference between the average apolipoprotein A1 in practice and atorvastatin with atorvastatin ($p = 0.009$) and that there was a significant difference between the Apo-A1 Tmryn- atorvastatin and the control groups ($p = 0.000$). Furthermore, there was a significant difference between Apo-A1 in atorvastatin and the control groups ($p = 0.000$).

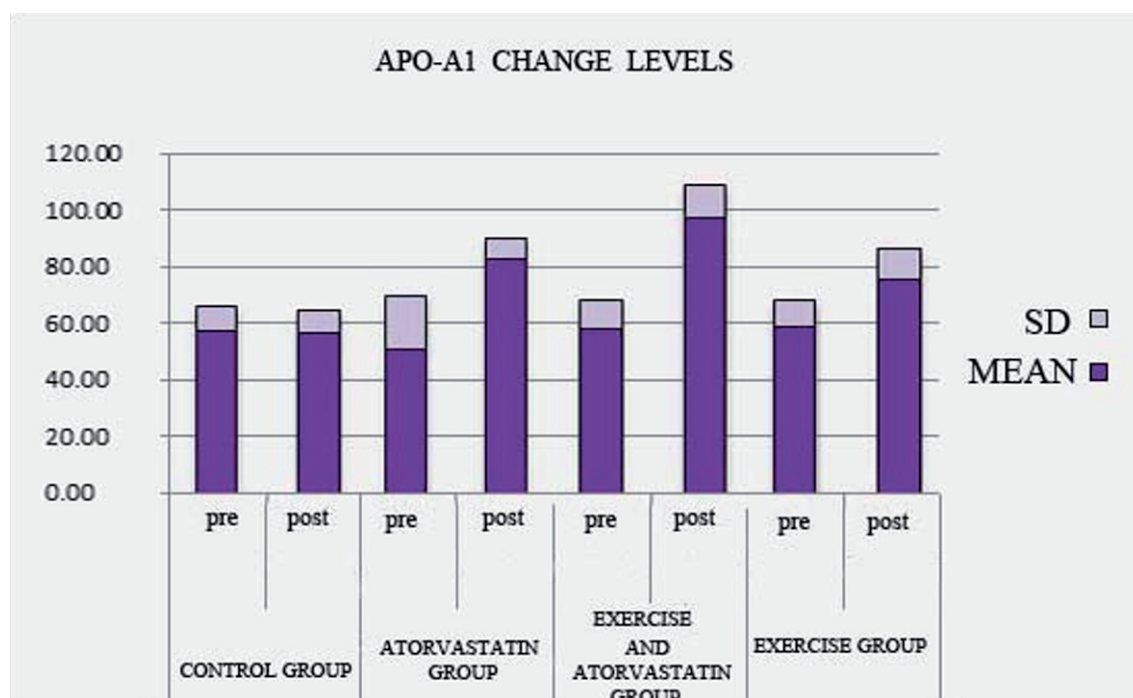


Fig. 4. The mean rate of change of Apo-A1 subjects before and after exercise

Discussion

In this study, aerobic exercise and administration of atorvastatin 20 mg daily have double roles in improving cardiovascular indicators such as lower blood pressure, increase the apolipoproteins AL, reduce blood levels of natriuretic peptides and creatine protein in patients over 12 weeks of training. Some studies have demonstrated that exercise and hydrotherapy play very significant roles in helping the treatment and rehabilitation of those patients. Since the mechanism of action of statins is to set the tone in the coronary arteries to improve blood flow process, exercise after a heart attack can potentially have synergistic effects of statin therapy. The molecular structure of atorvastatin hydroxyl metabolites can help them to act as electron donors (15). Because of the high-density of lipoprotein, anti-inflammatory and anti-thrombosis, increase in serum levels are regarded as a therapeutic target (16). C-reactive protein (crp) is a non-specific marker of inflammation which may reflect general health risk. Considerable evidence suggests that CRP is an independent predictor of future cardiovascular events, but direct involvement in atherosclerosis of it remains unanswered (17). Toyoma et al. demonstrated that statin drugs can have effects on decreasing the risk of cardiovascular events (18). Abdi et al. have shown that the combination of training and various doses of atorvastatin are more effective in improving of tissue damage caused by myocardial infarction rather than exercise and atorvastatin alone. However, the use of training with medical therapy can not reduce the dose of atorvastatin (19). It has been shown that the central function of HDL

related to the ability to suppress inflammation and oxidative its local events HDL excess cholesterol through mechanisms of specific flow through the cell membrane transporters, such as ABCA1, ABCG1 and SR-B1. Small HDL cholesterol particles as the main transporter ABCA1, is receptive (20). Exercise as environmental and internal factors in determining the hormone ANP regulate sodium and electrolytes in the body and that control of cardio-vascular and body temperature play important roles as well (21). Our findings of the BNP confirmed the results of researches Frasconi et al., Nilsson and colleagues, Clement et al. Some researchers compared the serum levels of ANP-outs between exercise and detraining did not see the difference (22). However, some studies have reported that decrease levels of ANP following by exercise programs (23). The effects of 5 months of combined training (endurance and resistance) on resting levels of BNP in patients with congestive heart failure were reported unchanged that contrasts with results. It might be to practice with the reduction in left ventricular end systolic diameter with end-diastolic dimension reduction leads to a decrease in the diastolic pressure walls and ultimately reduce the NT-BNP (24). Another factor that following by aerobic exercise can be effective in reducing the number of receptors for the hormone BNP, which in turn leads to increase connectivity BNP and eventually reduce it in the blood (25). All the above mechanisms can mainly be attributed to endurance training. It should be noted that heart size and hormone receptors have not been measured in our study. Reduce the level of apoprotein A1, and apoprotein B are associated with increase risk of coronary artery disease.

Statins are drugs as lipitor and blocking cholesterol storage and lowering LDL and increasing levels of APO-A1 and they have been proved to be adaptations of regular physical activity reduces LDL-C and increasing HDL (especially with increasing protein component APO-A1) (26). Exercise reduces levels of C-reactive protein and natriuretic peptides that including ANP and BNP (21). Studies have showed that doing exercise after a heart attack leads to dibule effects of statin therapy (18). Atorvastatin can also combine exercise and additional positive impact on the composition and stability of atherosclerotic plaques. Furthermore, atorvastatin is a statin that its consumption makes up nitric oxide and that increases vascular endothelial function(18, 19, 25, 26). A recent study in 2020 by D. Menichini et al showed that there is a significant association between sedentary lifestyle and BMI of more than 25 kg / m²; therefore, active lifestyle has played an important role on developing the health in low-risk pregnant women (27). The positive outcome of the other disease, L. Panella et al, found in elder patients with osteoarthritis confirms that Adopted physical Activity can improve physical and functional health through the participation of patients, reducing the pain intensity (28). As a result, it seems that regular physical exercises can prevent muscle atrophy and neutralize the side effect of the drug. Also, different results may be due to differences in intensity, duration and type of sports activity. In this study, exercise and administration of atorvastatin 20 mg daily have double roles in improving cardiovascular indicators such as hypotension, increases blood apo protein of high-density, low levels of natriuretic peptides and reduce C-reactive protein in serum as a positive adaptation during the 12 weeks of training. So the dose of atorvastatin may significantly reduce the effect on plasma cholesterol and LDL-C followed by a decrease and an increase in HDL-C and increasing particle protein to the lipid components.

Conclusion

Exercise and atorvastatin have senergestic effects and that can induce low blood pressure and increases blood flow. The use of exercise and atorvastatin increase Apo lipoprotein type A1 and reduce ANP, BNP, and CRP, followed by the reduction of disease cardio-vascular and improve heart function - vascular.

Conflicts: None

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