Original Article

Effect of Cardiac Rehabilitation on Blood Pressure and Functional Capacity in Patients after Myocardial Infarction

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Abstract

Background: Before the year 1950 treatment of myocardial Infarction patients was complete bed rest for several weeks and reduces physical activity for several months. Cardiac rehabilitation based on exercise training reduces the effects of deconditioning of bed rest. The primary purpose of this study was to determine the methods and means of prevention and treatment of coronary artery disease.

Materials and Methods: This study was designed clinical trial and cross sectional study before and after intervention, the effect of our new protocol was assessed according to method of Bruce stress test. Measurement consisted of Blood Pressure and Functional Capacity, which were recorded and compared before and after intervention.

Results: There was a significant increase in functional capacity according to method of Bruce stress test after ten session of training. The criterion deviation at functional capacity variable was 13.19±2.242 METS and 24.42±6.00 METS before and after 10 sessions. Respectively, this obtained METS (body oxygen survey at rest state equal to 3/5 milliliter oxygen to each kg person weight at minute) rise amount from secondary posttest to primary test ($P<0.05$). There was also a significant decrease in systolic blood pressure after ten session of training. The criterion deviation and average was 121.5±8.83 and 112.00±9.18 for systolic blood pressure. This decline amounts has a meaningful variable amount given P value <0.05.

Conclusion: Cardiac rehabilitation can increase the performance of blood circulation and uptake of oxygen in body. These changes showed a significant increase in functional capacity it can also reduce resistance of blood circulation and showed a significant decrease in systolic blood pressure.

Keywords: Cardiac Rehabilitation, Myocardial Infarction, Functional Capacity, Blood Pressure

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Introduction

Before 1950 treatment of myocardial infarction patients was complete bed rest for several weeks and reduces physical activity for several months[1-4]. Cardiac rehabilitation based on exercise training reduce the effects of deconditioning of bed rest. It can also delay the consequences of chest angina, chronic heart failure (CHF), myocardial infarction[1,2,11]. Exercise training is the base of cardiac rehabilitation but psychological consults and nutrition regimes are also a part of cardiac rehab[5,6]. Exercise is the base because it can increase functional capacity (F.C) and reduce cardiac ischemia and chest angina. It can also

reduce blood pressure[3,7].

Originally developed to assess the positive effect of low level sub max heart rate exercise protocols in researches[8-13] has since been extensively studied and used with heart failure, myocardial infarction, CABG patients and other cardiovascular conditions. It has been shown that these protocols can increase blood vessels by increase of VEGF (vascular endothelial growth factor-A) factor in blood[14]. In this study we aimed to assess the effect of a new protocol based on low level sub max heart rate exercise on myocardial infarction patients. The purpose of this study was to assess the effects of this protocol on blood pressure and functional capacity of post MI patients.

Methods

This study has been performed on 40 patients who had myocardial infarction by clinical experience method with 50-65 years age range and after declaring their well-informed consent. This people had been selected accidental from available statistical society (Heart and Veins unit of Modares Hospital of Tehran and Pooya rehabilitation center). Sampling method was simple and convenience type.

The criteria for entering to research includes lack of (heart rate and ECG extensive variations presence), ejection fraction above 35% (contractile ratio), and 4 weeks after last MI and being a heart rehab candidate which visited by physician. The patients with blood pressure less than 20 or rise more than 220/120 millimeter mercury and had headache, vertigo, ataxia, extensive paleness, nausea ST piece premature variations and other variations at ECG (as ventricular improper waves, PVC and V TACH, etc) and extensive arrhythmias became aside from the study.

The patient target heart rate was calculated using 65% maximum hurt rate formula. Then the functional capacity and blood pressure were determined using treadmill device, ECG, esaote biomed model, headset, lit man master model, and $ALpk_2$ model pointer metal pressure gauge device based on Bruce Stress test method and arriving the patients to her (his) target heart rate.

Then the patient was entered to our treatment protocol, that includes warm up formula with 2% slope and 2Km/h speed within 5 minutes, exercise stage with slope and speed variations as 1% rise to the slope and 1 Km/h in speed in order to arriving patients to target heart rate (T.H.R) (each process duration from EXS was 5 minutes). Then recovery process with 7.2% and 1Km/h speed and finally rest. The patients were under heart rehabilitation exercises at 10 sessions with above protocol, that their T.H.R first five sessions was calculated as 65% max. heart rate and last 5 sessions as 70% max heart rate.

After completing the heart rehabilitation sessions, the patient's blood pressure and functional capacity amount was evaluated and determined again based on Bruce stress test method.

Pair sample T test was used for analyzing the information given a normal data distribution, except two cases from variables that had abnormal distribution, that Wilcox on Method was used. In this study, value was less than %5, and SPSS Software was used for analyzing the data.

Results

Of 40 studied patients were 28 male and 12 female. The studied patients were at 50-60 years age range, and their age average was 57 years, 7 months, and 7 days. The average delay duration was 25 days at the treatment beginning. The less delay amount and the most delay amount were 15 and 30 days respectively. (Body oxygen survey at rest state equal to 3.5 milliliter oxygen to each kg person weight at minute) was used for reviewing the functional capacity variable.

From METS scale The arrange and the criterion deviation at the functional capacity variable was 14.99±2.242 and 24.92±6.00 before and after 10 heart rehabilitation sessions respectively, that this obtained METS rise amount from secondary Post Test to primary one with p value <0.05 has a meaningful for us (Figure 1).

At reviewing patients diastolic and systolic blood pressure, the criterion deviation and average was 122.5±8.83 and 110.00±9.18 for systolic blood pressure immediately after performing the test before and after 10 heart rehabilitation session respectively, that this decline amount had a meaningful for us only at systolic blood pressure variable amount given P value <0.05 (Figure 2).

At reviewing the patients diastolic and systolic blood pressure, the criterion deviation and average was 122.5±8.83 and 110.00±9.18 for systolic blood pressure

immediately after performing the test before and after 10 heart rehabilitation session respectively, that this decline amount has a meaningful for us only at systolic blood pressure variable amount given P value <0/05 (Figure 2).

At reviewing the patients diastolic and systolic blood pressure, the criterion deviation and average was 75.5±8.83 and 71.00±9.18 for diastolic blood pressure immediately. After performing the test (before and after 10 heart rehabilitation session respectively) this decline amount was not meaningful for us at diastolic blood pressure variable amount given P value <0/05 (Figure 3).

Discussion

In this study the meaningful rise was seen at functional capacity (F.C) using METS scale. This rise shows the muscular performance improvement that it also increases the oxygen uptake at the body. There are several other studies about the effect of low level exercise protocol using METS scale on cardiac patients[15,16]. Sullivan et al.[9,17] believed that patients after MI have low output so intake of O2 in high level exercise protocol will have problem because of this reason for increase of functional capacity they recommended low level exercise protocol.

Haitsma et al.[10,18,19] in their studies found that high

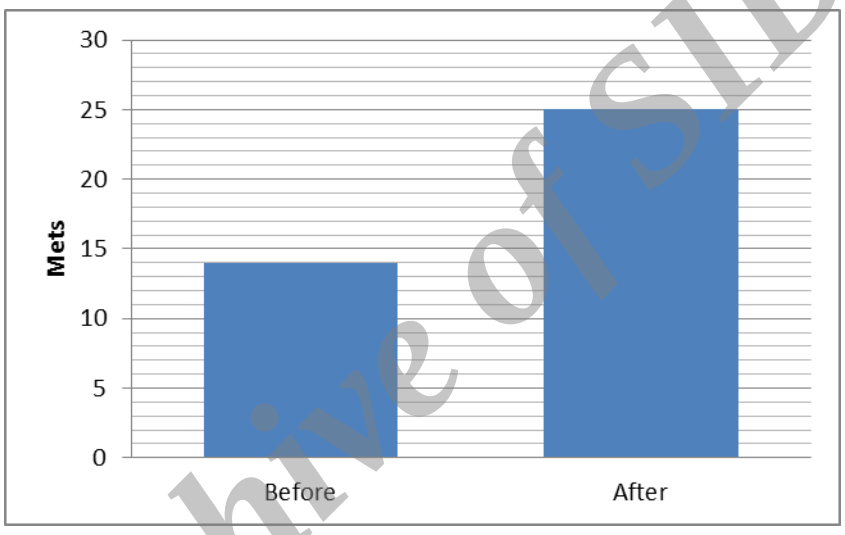

Figure 1. Patients functional capacity variations amount review based on Mets scale before and after cardiac Rehabilitation

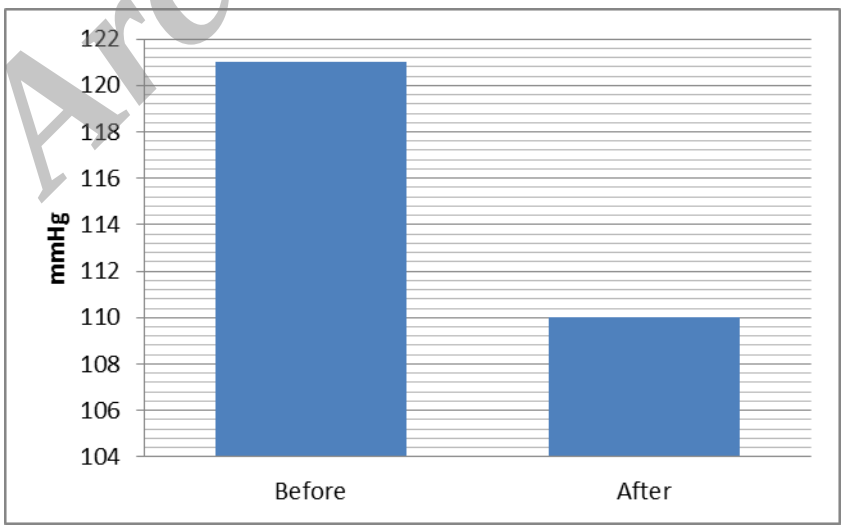

Figure 2. Patients systolic blood pressure variations amount review based on millimeter mercury before and after the heart rehabilitation

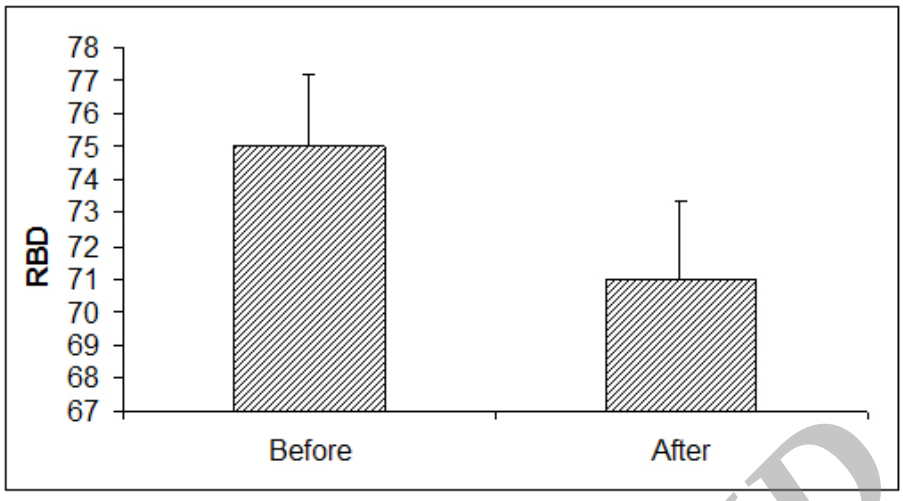

Figure 3. Patients Diastolic blood pressure variation amount review based on before and after cardiac rehabilitation

level exercise protocol (Max Heart Rate>85%) in post MI pigs will not make ischemic disorders and we will not have low output although oxygen uptake decrease and perfusion of muscles will be low but these problem is not due to low output of heart.

Nieuwland et al.[11,12,16] found that ventilation of air threshold (VAT) in patients with low level exercise protocol with high frequency will increase more than patients with low level exercise protocol with low frequency. But amount of O_2 peak in both groups of patients with high frequency or low frequency in one kind of low level exercise protocol (60% to 70% Reserve Heart Rate) was same. For this reasons, they recommended low level exercise protocol with high frequency especially when the aim of treatment is increase of functional capacity. Because of Rise of VAT in post MI patients after high frequency protocol these patients was stay longer in last stress test because they had less lactate in their blood. Other reason is strength of muscles and better performance of motor skill. In order to these researches meaningful rise in functional capacity in our treatment protocol is because of our low level exercise protocol.

About other hemodynamic factors we had a meaningful decrease in systolic rest blood pressure but not in diastolic blood pressure.

El-Tanawy et al.[13,14,20] reported that in compare of the effect of high frequency protocol with low frequency protocol in hemodynamic of CAD patients. Effect of high frequency protocol on FC, quality of life, and blood pressure is more.

Nieuwland et al.[11,12,21] believed that only high frequency protocol can obviously improve blood pressure factors. So because of our protocol (Low Frequency Exercise) decrease of systolic blood pressure was significant but decrease of diastolic blood pressure was not meaningful for us.

Although this kind of protocol (low level sub max heart rate exercise with low frequency) is useful for increase of functional capacity and decrease of systolic blood pressure but the amount of decline in diastolic blood pressure is not obvious.

Conclusion

Although cardiac rehab is long duration process with expensive equipment but increase of functional capacity and improvement of many hemodynamic factors like blood pressure and heart rate, etc. and the effect of these protocol on quality of life for CAD patients lead us to permit patients to use this benefit protocols under supervision of professional doctors, cardiac rehab physiotherapist and nursing in order to be the routine medical or physical therapy treatment of post MI patients.

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