Effect of Moderate Intensity of Aerobic Exercise Programme on Exercise Tolerance Capacity of Stable Angina Patients

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Abstract

The purpose of this study was to observe the effect of moderate intensity of aerobic exercise programme on exercise tolerance capacity of stable angina patients. Sixty male patients of stable angina were recruited as subjects and their age ranged from 40-60 years, further they were divided equally into experimental group and control group. Experimental group underwent a six weeks moderate intensity aerobic exercise programme while the control group was lead a routine sedentary life style for six weeks. Exercise tolerance capacity was measured by using Borg's scale in both the groups on the first day and after every 2 weeks. It was found that at the end of six weeks of aerobic programme there was an increase in the exercise tolerance capacity of the stable angina patients of the experimental group than control group. It is concluded that six weeks moderate intensity aerobic exercise programme of cardiac rehabilitation for the patients of stable angina is a short time period for peripheral adaptation than the central adaptations.

Key words: Cardiac rehabilitation, Borg's Scale, THR, RHR

Introduction

Stable angina is defined as a short duration chest and/or arm discomfort that shows no change in the past 60 days in frequency, duration or precipitating cause. Most often pain duration is less than 10 minutes and rarely up to 15 minutes. The mild to moderate discomfort is relieved within 1 to 10 minutes by cessation of the particular precipitating activity or use of sublingual nitroglycerine *(Khan, 2006).* Most patients with stable angina will be at increased risk of subsequent cardiovascular events or death, the assessment of a patient's absolute risk of subsequent cardiovascular events or death should be based on assessment of all of his risk factors as well as modifiable risk factors include age, sex, presence of diabetes, and family history of premature coronary heart disease. Exercise training is an effective method of reducing episodes of angina in people with stable angina. Chronic low intensity aerobic exercise trains the cardiovascular system and the skeletal muscles to become more efficient which means that one can exercise at higher levels of intensity without experiencing angina. A program of aerobic exercise has many benefits in addition to reducing episodes of angina. The physiological changes both in exercising skeletal muscle and the myocardium play a role in the symptomatic improvements and increased maximal work capacities in individual with coronary artery disease after regular aerobic exercise *(May and Nagle, 1984).*

Materials and Method

A sample of 60 male patients of stable angina between the age group 40-60 years were randomly divided into the experimental group and the control group of 30 patients in each group. The experimental group was prescribed cardiac rehabilitation in the form of

aerobic exercises for 30 minutes, 4 times a week for 6-weeks. The control group was not prescribed any cardiac rehabilitation and was advised to live their normal sedentary life. The experimental group was administered exercise at an intensity calculated by Karvonen's formulae:-

For the first two weeks

$$\dot{THR} = \dot{RHR} + 31\% (\dot{HR}_{max} - \dot{THR}).$$

Next two weeks

$$\dot{THR} = \dot{RHR} + 35\% (\dot{HR}_{max} - \dot{THR}).$$

Last two weeks

$$\dot{THR} = \dot{RHR} + 40\% (\dot{HR}_{max} - \dot{RHR}).$$

$\dot{RHR}$ Stands for resting Minute heart rate

$\dot{THR}$ Stands for Target Minute Heart Rate

$\dot{HR}_{max}$ is the Maximal Minute heart rate

The exercise tolerance was measured by Borg's Scale (6-20 scale) after every 2 weeks at the time of exercise for the experimental group and at leisure time for the control group. Data was computed for paired student's test after every 2 weeks in the same group to observe the effectiveness of cardiac rehabilitation.

Results and Discussion

Table 1: Mean ± SD of Scores of Borg's scale of the experimental and control group

Group	Stage	N	Mean	SD	SEM
Experimental	B	30	14.48	0.82	0.15
	2w	30	15.67	0.88	0.16
	4w	30	16.53	0.63	0.11
	6w	30	14.13	0.9	0.16
Control	B	30	14.4	0.62	0.11
	2w	30	13.9	0.89	0.16
	4w	30	13.67	0.61	0.11
	6w	30	13.33	0.71	0.13

B-before the start of rehabilition, 2w- after two weeks, 4w- after four weeks, 6w- after six weeks,

Table 1 shows the mean values of the scores of Borg's scale of the subjects of two groups. The score on the Borg's scale expressed the perceived exertion of the patients during exercise. The 15-Grade Borg's scale read the scores from 6-20 as the rate of perceived exertion. The score of 13 on the Borg's scale indicated somewhat hard intensity of exercise and 15 referred to heavy exercise intensity. After the cardiac rehabilitation of 6-weeks, the mean scores (Table 1) on the Borg's scale showed changes with the increase in the intensity of exercises advised. Paired t- test (Table 2) was applied to observe the differences between every two consecutive week intervals.

Table 2: Comparison of Scores of Borg's Scale between Experimental and Control group before and after at every consecutive 2 weeks

Group	Stage	N	Mean Difference	SD	SEM	t
Experimental	B-2w	30	-1.2	0.55	0.1	11.93
	2w-4w	30	-0.87	0.63	0.11	7.55
	4w-6w	30	2.4	0.85	0.16	15.37
	B-6w	30	0.35	0.86	0.15	2.33
Control	B-2w	30	0.37	0.81	0.15	2.48
	2w-4w	30	0.37	0.56	0.1	3.61
	4w-6w	30	0.33	0.57	0.14	3.34
	B-6w	30	1.07	0.92	0.17	6.29

Significant at 0.05 level

The experimental group showed a trend of rising intolerance at the end of 2nd week and at the end of the 4th week, but mean scores indicate that there was an improvement in the exercise tolerance at end of the 6th week. On the other hand, the

control group showed a gradual decrease in the exercise intolerance (Table 1). The experimental group showed a significant difference at every successive 2 week interval (Table 2). On the other hand, the control group also slowly gained the comparative exercise tolerance to demonstrate a significant difference between the initial patients exercise tolerance after a sedentary lifestyle of 6 weeks. The rest at home and reduction of the psychological stress may be the reason for perceiving less exertion in the initial 4 weeks in the control group but perceived exertion experimental group on the Borg's scale the at the end of 6^{th} week was although greater than the mean of the control group but still comparabe. Lack of development of aerobic capacity and cardiovascular fitness in the control group might have lead to low physical work capacity in them even for doing activities of their daily living.

The reduced exercise capacity has been related to the de-conditioned state of the muscle and the reduced aerobic capacity of the subjects. *Minotti and Massie (1992)* are of the view that the de-conditioning of peripheral musculature due to inactivity may play a role in exercise tolerance, there is a difference noted at cellular level between muscle cells of de-conditioned healthy subjects and those of patients with chronic heart disease. Recent studies have revealed intrinsic changes in skeletal muscle fibers which may be responsible for impaired metabolism and result in early fatigue. These changes include reduced mitochondrial density, reduction in lipolytic oxidative enzymes and fiber atrophy *(Coats, 1993)*. The fact lies in that exercise training for the experimental groups improved the functional capacity and reduced the myocardial ischemia and angina symptoms in patients with stable coronary heart disease *(Leon et al, 2005)*. Endothelial dysfunction is known to be the precursor of atherosclerosis (*Davignon & Ganj, 2003)* and *Nigam et al (2004)*. The effects of exercises has been shown to improve endothelial function by increasing shear stress-induced flow mediated arterial vasodilatation *(Walter et al, 2004, and Haram et al, 2006)* and this increased shear stress on the arterial wall during exercise leads to increased production and release of nitric oxide from the endothelial cells *(Shen et al, 1995)*; nitric oxide is responsible for endothelium dependent vasodilatation of the coronary arteries *(Ignarro, 1989)*. This vasoactive substance has numerous antiatherosclerotic antithrombotic effects *(Freedman & Loscalzo, 2003)*.

Conclusion

It was found that at the end of six weeks aerobic programme there was an increase in the exercise tolerance capacity of the stable angina patients of the experimental group as compared to the control group. It is concluded that six weeks moderate intensity aerobic exercise programme of cardiac rehabilitation for the patients of stable angina is a short time period for peripheral adaptation than the central adaptations.

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