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30	urnal or Pa	ORIGINAL RESEARCH PAPER	Physiology				
Indian	PARIPET	ASSESSMENT OF CARDIOVASCULAR PARAMETERS IN THE RECOVERY PERIOD AFTER AN ACUTE MI IN PATIENTS UNDERGOING EXERCISE TRAINING	KEY WORDS: exercise prescription, post MI, recovery parameters				
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ABSTRACT

Prescription of exercise training in order to rehabilitate patients of acute myocardial infarction (MI) has been a subject of debate as regards to the type, intensity, frequency, duration and volume of exercise which have helped to develop a rationale for prescribing and evaluating potential dangers of exercise in acute MI. *Aim:* to assess the effect of exercise training in post MI period on heart rate and blood pressure in the recovery period. *Method*: 100 patients of first event acute anterior or anterolateral MI were selected and randomly divided in Case group who were given an exercise prescription for 10 weeks and Control group who were given only secondary prevention advice. Both groups were monitored in 3 phases (I: ICCU, II: Step down, III: week 1-10 at home). Safety precautions as per AHA guidelines were followed. Case group patients were prescribed exercise in gradually increasing intensity involving early ambulation in ICCU and step down. Post discharge exercise involved brisk walk, climbing 1 flight of stairs and 1Km walk over 30 min. Observations were documented at the end of week 1,2,3,4 and 10. *Observations:* Not much changes in Systolic and Diastolic BP as well as HR were observed in phase I and II. However at the end of Phase III significant changes were observed in early recovery of cardiovascular parameters (SBP, DBP and HR) for case group when compared to the control group indicating beneficial effects of exercise prescription in these patients. *Conclusion*: Exercise prescription in Post MI patients is effective in safe and early rehabilitation of patients to resume their normal activity.

Introduction:

Cardiac rehabilitation after myocardial infarction has been a subject of debate for many decades. There were times when the absolute bed rest policy was being advocated by many physicians and it was thought the myocardial recovery is best when the patient is prescribed bed rest for many months and his physical activity is restricted so as not to tax the cardiovascular system with burden of day to day routine activities. However, in the past 2-3 decades there has been an enormous change in the way post myocardial infarction period is managed. There has been complete revolution of thinking in ways and means to chalk out protocols and norms of prescription which will bring the patient sooner than later to his normal physiological activity level prior to the cardiac to post angioplasty, post CABG, Surgical correction of congenital heart diseases and also for stable congestive cardiac failure (2-5).

There has been revised understanding of the physiological effects of regular exercise and exercise induced changes that might improve cardiac performance. There have been various publications on influence of the type, intensity, frequency, duration and volume of exercise which have helped to develop a rationale for prescribing and evaluating potential dangers of exercise in a heart complicated by acute myocardial event (6-10). Specific guidelines for evaluation of the patient before initiating an exercise programme are provided in detail by American Heart Association (11-12)

The prescription of exercise programme after MI is considered to be safe and the risk of adverse coronary event or death during exercise is low. Several randomized controlled trials of moderate to high intensity exercise training in patients after large myocardial infarction have not demonstrated adverse effects on regional wall motion, left ventricular systolic function or LV dimension after several months of exercise training programme (13,14). Secondary prevention, trough cardiac rehabilitation exercise programmes which deal with bringing the patient back to acceptable level of physiological functions is being integrated into long term care of

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all patients with cardiovascular diseases particularly those related to coronary artery disease (15,16)

Material and Methods:

This prospective study was conducted in the department of physiology and department of Cardiology of Christian Medical College, Ludhiana. One hundred patients of first episode of Acute MI with uncomplicated anterior wall or anterolateral MI admitted to Intensive Coronary Care Unit of the hospital were included in this study over a period of 2 years. Exclusion criteria included those over 75 years of age, reinfarction, complicated MI, involvement other than anterior or anterolateral wall and those with other non cardiac problems like COPD, bronchial asthma, recent surgeries or severe orthopaedic problems that may hinder their participation in an exercise programme. An informed consent was taken for each patient included in the study.

The patients were divided into 2 group l(study) patients who were given a prescribed exercise protocol and Group II (control) patients who were administered only secondary prevention advice but no exercise programme. The following exercise programme was followed for each patient of Group I which started from the ICCU and continued till the end of 10th week. After the discharge from the hospital, the patient were followed up in the OPD and advised regarding exercise protocol and compliance to the prescribed schedule of physical activity.

PHASE	LOCATIO	DAYS/	ACTIVITY
	Ν	WEEKS	
I	ICCU	3-5 days	Assisted mobilization: sitting on bedside chair, self-care activities (shaving, oral hygiene, sponge bathing)
	Step down	6-7 days	Sit up and stand (unassisted, supervised)
1		8-10 days	Walking in their hospital rooms: start with 5 min daily: increase to 10 min daily

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II	OPD/ Physioth erapy Dept/Ho me	1st Week	10 min normal walk 5 days at home: 10 min supervised brisk walk in Physiotherapy Dept. 2 days
		2nd Week	15 min normal walk 4 days at home: 10 min brisk walk 2 days at home: 15 min brisk walk 1 day in Physiotherapy Dept.
		3rd Week	10 min brisk walk 6 days at home: supervised climbing 1 flight of stairs in Physiotherapy Dept. 1 day
		4th Week	15 min brisk walk 5 days at home: climbing 1 flight of stairs 2 days at home.
	Home/Ph ysiothera py/cardio logy	5-6 Weeks	Per Week,~ 500 m Over 20 min brisk walk 5 days + climbing 1 flight of stairs 2 days at home: follow-up at end of 6 weeks for compliance
	Dept.	7-8 Weeks	Per week,~ 700 m over 25 min brisk walk 5 days+ climbing 1 flight of stairs 2 days at home: follow-up at end of 8 weeks for compliance
		9-10 Weeks	Per week,~ 1 Km over 30 min brisk walk 5 days + climbing 1 flight of stairs 2 days at home

Baseline assessment of lifestyle and risk factors was carried out for all the patients inducted into the study which included activity assessment, occupational status, diet (based on 3 days recall), Body Mass Index, waist circumference, smoking status, blood pressure, lipid profile, blood sugar and medical history. All patients were advised on secondary preventive strategies to reduce the risk or reinfarction in subsequent years in life.

Patients were assessed for any changes in their cardiovascular parameters like blood pressure, left ventricular ejection fraction and work performance (physical activity level) as well as for change in BMI, lipid profile, fasting blood glucose at the end of 4^{th} week and 10^{th} week after the discharge from hospital.

Observations: The following observations were made In all patients with episode of ECG and cardiac enzymes proven myocardial infarction limited to anterior or anterolateral segment

Table 19: Data Collected at Week 1 follow up visit

NI NI					
DS IN	Mean	Std. Deviation	df	't'	P value
s 50	138.4000	11.66890	98	613	.541
ol 50	140.4000	19.89359			
s 50	84.0000	7.28431	98	1.935	.056
ol 50	81.2000	7.18275			
s 50	86.7400	5.51366	98	585	.560
ol 50	87.4600	6.73768			
s 50	65.9200	11.69134	98	.231	.818
ol 50	65.3800	11.66521			
	S IN s 50 ol 50 s 50 ol 50 ol 50 ol 50 ol 50 s 50 ol 50 s 50 ol 50 ol 50 s 50 ol 50	Image: None Image: None s 50 138.4000 ol 50 140.4000 s 50 84.0000 ol 50 84.0000 ol 50 81.2000 s 50 86.7400 ol 50 87.4600 s 50 65.9200 ol 50 65.3800	S N Mean std. Deviation s 50 138.4000 11.66890 ol 50 140.4000 19.89359 s 50 84.0000 7.28431 ol 50 81.2000 7.18275 s 50 86.7400 5.51366 ol 50 87.4600 6.73768 s 50 65.9200 11.69134 ol 50 65.3800 11.66521	Stat. Deviation at s 50 138.400 11.66890 98 ol 50 140.4000 19.89359 98 ol 50 84.0000 7.28431 98 ol 50 81.2000 7.18275 98 s 50 86.7400 5.51366 98 ol 50 87.4600 6.73768 98 s 50 65.9200 11.69134 98 ol 50 65.3800 11.66521 98	Std. Deviation Off C s 50 138.4000 11.66890 98 613 ol 50 140.4000 19.89359 -

The table shows data of Blood Pressure pulse and weight between case and Control groups. The mean blood pressure systolic in case was 138 and 140 in control group. The diastolic incase and control groups were 84 and 81 respectively. The pulse in case group was 86.4 and in control were 87.4. The mean weight in case and control group was 65.0 and 65.3 respectively. All these p values are statistically insignificant.

Table 20: Data collected at week 2 follow up

	Groups	Ν	Mean	Std.	df	't'	Р
				Deviation			value
Systolic B.P	Cases	50	135.0000	11.64965	98	-2.208	.030
	Control	50	139.4000	7.93082			
Diastolic B.P	Cases	50	83.6000	6.92821	98	-1.222	.225
	Control	50	85.2000	6.14120			
Pulse	Cases	50	87.0000	6.11789	98	.140	.889
	Control	50	86.8600	3.49933			

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Weight	Cases	50	61.7600	10.86571	98	-3.917	.049
	Control	50	57.5800	10.168			

This table shows blood pressure systolic and diastolic mean in case group 135 and 139 respectively. Diastolic was 83 and 85 mm Hg respectively. The pulse in case and control group was 87and 86/min. The weight was 61.7 in case group and 57.5 in control group. The p value for all parameters was statistically insignificant.

Table 21: Data Collected at week 3 follow up

	Groups	Ν	Mean	Std.	df	't'	Р
				Deviation			value
Systolic B.P	Cases	50	142.8000	14.00292	98	1.179	.241
	Control	50	140.0000	9.25820			
Diastolic	Cases	50	82.2000	8.40068	98	.373	.710
B.P	Control	50	81.6000	7.65586			
Pulse	Cases	50	85.1400	12.54219	98	967	.336
	Control	50	86.9400	3.99699			
Weight	Cases	50	61.9200	11.53847	98	1.995	.049
	Control	50	57.5800	10.16816			

This table shows data of blood pressure in case and control group. The mean in case group was 140/82 and in control was 140/81 mmHg. The pulse rate in case and control group was 85 and 86/min.The weight mean in case and control was 61.9 and 57.5Kg respectively. The p value for all variables was non-significant statistically.

Table 22: Data Collected at week 4 follow up

	Groups	Ν	Mean	Std. Deviation	df	't'	P value
Systolic	Cases	50	141.0204	14.03046	98	-3.137	.002
B.P	Control	50	147.6000	4.76381			
Diastoli	Cases	50	84.4898	10.21870	98	1.271	.207
c B.P	Control	50	82.0000	9.25820			
Pulse	Cases	50	86.6327	6.29714	98	-2.245	.027
	Control	50	88.9000	3.33350			
Weight	Cases	50	69.0408	12.56145	98	1.368	.175
	Control	50	65.9400	9.86317			

The above table shows blood pressure recordings of case and control groups. The mean blood pressure recordings were 141/84 mm/ Hg for cases and 147/82 mm/ Hg for controls. The pulse and weight for case and control group were 86 and 88/ min and weight was 69 Kg in case group and 65 Kg in control group. The p value for these parameters was not statistically significant.

Table 23: Data Collected at week 10 follow up

	Groups	Ν	Mean	Std. Deviation	df	't'	P value
Systolic	Cases	50	138.8400	23.04243	98	-3.175	.002
B.P	Control	50	149.4000	4.69911			
Diastoli	Cases	50	80.8000	8.99887	98	.335	.738
c B.P	Control	50	80.2000	8.91914			
Pulse	Cases	50	76.5200	16.47415	98	-5.141	.000
	Control	50	88.7800	3.59870			
Weight	Cases	50	65.6800	15.85063	98	-1.337	.184
	Control	50	69.4600	12.18097			

The above table shows the blood pressure in case and control group. It was 138/80 and 169/80mmHg. The pulse in the case and control groups was 76 and 88 beats/ min the weight in case and control was 65 and 69Kg respectively. The p values in blood pressure and weight were not significant. The p value for pulse was found to be significant.

The patients were comparable in terms of age, sex and weight distribution in both the groups and all of them presented with general symptoms of angina, palpitations, fatigue or dyspnoea on exertion. Presence of co-morbidities like diabetes and hypertension were equally prevalent in both the groups.

In the post infarct follow up at 1week, 2 weeks and 4 weeks period there was no significant statistical difference between group 1 and Group II patients in terms of heart rate, SBP and DBP Patients also

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underwent routine lipid profile estimation and echocardiography at the end of 10th week not as a part of the present study but routine examination.At the 10th week follow up we noticed significant reduction in the blood total cholesterol levels in the exercising group. A significant improvement was observed in the ejection fractions of those patients who underwent exercise training programme at the end of 10th week. Patient in case group were also seen to tolerate ischemia better and were psychologically better adapted to overcome the trauma of acute MI which helped them to restore their normal self once again in the post MI period.

Discussion:

The prevention of subsequent coronary events and maintenance of normal physical functioning in a patient with first episode of MI is a challenging task. This study assessed the prognostic value of assessment of left ventricular function and other cardiovascular parameters in patients undergoing cardiac rehabilitation through normal physiological exercise following acute MI. Patients with first MI represent the majority of all patients with acute infraction (60%-80%) (17). The most potent prognostic variables are those relating to the extent of myocardial damage after the infarction (18,19) Many factors play a significant role in recovery in such patients and therefore would affect how soon the pathology (Acute MI changes) would revert to near normal physiology in an individual. These factors include age, sex, family history of CAD, diabetes or hypertension, previous history of angina, lifestyle factors like alcoholism, smoking, sedentary lifestyle and diet.

Our study showed significant improvement in LV ejection fraction of patients who had undergone a regular exercise regimen as compared to those who were not prescribed any exercise in the post hospital discharge period. Similar results have been observed in other studies done by Brandi et al (20), Dugmore et al (21) and Haskel et al (22). In addition to improvement in LV function, exercise training and regular physical activity can result in moderate losses in body weight and adiposity (23), improvement in blood pressure regulation (24), regulation of serum triglycerides and better diabetic control. The present study also showed significant reduction in total cholesterol level in patients who underwent exercise training as compared to those who did not.

Conclusion:

Inclusion of an exercise training schedule for gradual, graded physical activity over a period of 10 weeks following an acute myocardial event in addition to the secondary prevention strategies are likely to result in reduced morbidity and mortality due to CAD and would help the patient to return back to their normal daily routine and physiological parameters within the accepted homeostatic limits sooner.

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