Original Article

Low level treadmill testing of 50 patients with acute myocardial infarction prior to discharge from hospital

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Summary:

Objectives: (1) to describe the hemodynamic and electrocardiograph (ECG) responses in patients with acute myocardial infraction (AMI) to a low level treadmill test (2) to assess the safety of low-level treadmill testing after AMI (3) to determine if information gained from the test can be used for discharge planning.

Methods: 50 consecutive patients with AMI were subjected for symptoms limited treadmill testing in the CCU of University Teaching Hospital Iraqi medical College, their age range was from 30-70 with mean age of 55 years. Blood pressure, heart rate, and ECG during a low level treadmill test studied 6 days after AMI. They were divided into two groups, group 1 those who could finish the test and group 2 those who couldn't finish the test.

Results: 38 patients (76 percent) completed the test. Fatigue was the main reason for the early stopping of the test. Between the rest and maximum exercise there was 12% increase in systolic blood pressure, 6 percent increase in diastolic blood pressure and 17 percent increase in heart rate. The resting systolic blood pressure, diastolic blood pressure and heart rate were significantly increased (p<0.05) in the patients who were unable to finish the test. ST segment elevation or depression>1mm was seen in 5 patients.

Conclusions: This low level treadmill testing was safe if it is done under supervised conditions. It provides an objective information about the patient's readiness for discharge and a help in future management of the patients.

Key wards: Myocardial infraction , Rehabilitation , Treadmill test.

Introduction

Every major illness, including a cardiac event, carries with it the potential of physical disability. Rehabilitation, an integral part of nursing , is a dynamic health oriented process that helps individuals who have survived a cardiac event to achieve their greatest possible level of physical, mental, spiritual, social and economic functioning[1]. Since early mobilization after acute, myocardial infarction(AMI) does not significantly increase morbidity and mortality rates, activity programs during the acute phase of AMI and early discharge from hospital have become accepted practice[1-4].

Duffy[5] (1988) noted that people consistently were reporting a sence of well-being as a direct benefit of engaging in exercise.

Assumption was made that if patients were safely able to perform a specific amount of work on the treadmill, they would also be able to perform activities at home that require similar levels of energy expenditure. Therefor, the objective of this study is to(1) describe the hemodynamic and electrocardiograph responses of patients with AMI to a low level treadmill test (2) to assess the safety of low-level treadmill testing after AMI (3) to determine if information gained from the test can be used for planning the future management of those patients.

Patients and methods

50 consecuative patients with AMI were subjected for a symptoms limited treadmill testing in the CCU of University Teaching Hospital of Iraqi medical

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College . Their age range was 30-70 with a mean age 55 years. They were divided into two groups, group 1 those who could finish the test and group 2 those who couldn't finish the test. The age and sex distribution of these patients are shown in table-1-and the site of MI are listed in table-II-.

The specific criteries for including patients in treadmill testing were:

1-A clinical diagnosis of AMI for the 1st time.

2-Absence of complication at the time of testing

3-patients ability to walk.

4-patients agreement to participate in the study.
EOE Go222 M model Marquette Helliga case 16 exercise testing provided the required speed and gradients. An electrocardiogram Marquette case 12 lead ECG and to continuously monitor lead 11 of the ECG during the treadmill walk and recovery. Blood pressure measurements were obtained by cuff with an eneroid (Tycos) manometer (suntech medical instrument,the motion tolerant Blood pressure company). A 12 leads ECG was recorded before, during and after the test . A 6 lead chest ECG was recorded every second during exercise. Blood pressure was recorded before, during and after exercise test.

Checking the heart rate, blood pressure, chest pain and arrhythmias were continued for 15 minutes after exercise or until all exercise induced abnormality have been disappeared.

The test is stopped if (l) (chest pain developed or signs of distress appeared (2) significant ST segment depression or elevation at least 0.1 Mv for 0.06 second after j point, during exercise compared to the resting ST segment (3) fall in systolic blood pressure of more than 10 % below the peak blood pressure protocol period (4) ventricular tachycardia or high degree atrioventricular block.

The testing exercise was supervised by a doctor trained in the CCU. The exercise laboratory equipment were checked constantly by the investigator who organizes them for the patient safety. Testing was done between the 5th and 7th day after AMI (means 6 days)

Statistical analysis:
T-Test for dependent sample was used.

Results

The hemodynamic responses of all the patients included in the study are shown in Fig-1-. The increase in systolic blood pressure was from 129.66 to 145.28 mmHg. The increase in diastolic blood pressure was from 79.42 to 84.48 mmHg. The heart rate increased from 82 to 96 beat per minute. Seven of the 50 patients showed minor ECG changes during recovery from the low level tests. Three patients showed ST segment elevation > 1 mm, two showed ST segment depression > 1 mm and two developed minor arrhythmias. Of the 50 patients 12 (24 percent) stopped or were stopped by the investigators at various intervals during the testing (group 2), three stopped during the first minute, five during the second minute and four during the last minute of the treadmill test.

The age and sex distributions in group 1 and group 2 are shown in table-1-. Distribution of the site of infarction diagnosed by presence or absence of Q wave are shown in table -11-. The reason of early tremination of the test is as follows: one patient complained of anginal pain with ST segment depression during the second minutes of the exercise, the test was stopped and the pain subsided with nitroglycerine tab within 5 minutes of recovery, two patients complained from chest pain without ECG changes, the test was stopped within the last minute of the treadmill test and the pain subsided with one nitroglycerine tab within 3 minutes of recovery, three patients were stopped because of ST segment elevation, two during the last minute and one during the first minute, and one patient was stopped because of ST segment depression in the absence of angimal pain during the second minute. Minor arrhyrhmias like ventricular ectopic was the reason for stopping (two patients) during the first minute . Also fatigue was the reason for stopping during the second minute. Dizziness and leg pain were also the reason for stopping the test at variable time.

Fig. 2 illustrates the higher hemodynamic values of the group 2 as compared with the group I at rest and shows that those remain higher at peak exercise (0 recovery) and through 3 minutes of recovery. A comparison of mean resting values using the t-test showed that the mean resting heart rates, systolic blood pressure were significantly increased ($p < 0.05$) for the group 2. Recovery of the systolic blood pressure was slower in group 2. Mean systolic blood pressure for the group I at 3 minutes into recovery was within 1 mm Hg above the resting values, where as for the group 2 it was still 12 mm Hg above the resting value.

Table 1. Age and sex distribution of 50 patients

Variables	Patients			
	Group 1		Group 2	
	No.	%	No.	%
Men	35	92	6	50
Women	3	8	6	50
Mean age (range)	55 (30-70)		61 (40-69)	

Table II. Sites of myocardial infraction

	Group 1	No.	%	Group 2	No.	%
Q wave	Inferior-posterior	16	42		4	33
	Anterior-lateral	18	48		6	5
	Extensive Anterior	2	5		1	8
	Group1	**No**	**%**	**Group2**	**No**	**%**
Non Q wave	Subendocardial Infraction	2	5		1	8

Discussion

Mobilization and resumption of normal activities after a period of bed rest are known to be associated with rapid recovery of functional capacity in acute M.I. 8

In this study it has been shown that a low cost, low intensity group exercise program was almost as an effective in the short term as an aerobic exercise training for the rehabilitation of patients after AMI. Ericsson and Co-workers6 studied 100 patients under 65 years of age at 21 days after MI for any tendency toward arrhythmias on exertion.Blood pressures and heart rates were not reported . The treadmill test consisted of walking at workloads of 100,200,300 kilopond. Meters per minute for 4 to 6 minutes each. The patient progressed to each subsequent work load if heart rate remained below 120 beats per minute. The work loads used by Ericsson and Co-workers were higher than those in our test but their test was performed later in the recovery period. For further emphasize on the important and prognostic value of exercise duration Dillahant and Miller7 studied 28 patients 2 weeks after AMI. Their patients walked on a motorized treadmill at 1 mph on 0% grade for 5 minutes and terminated the test because of symptoms; ST-T changes and arrhythmias. All these studies showed that patients were able to perform certain mounts of physical activity and that exercise testing is safe when symptoms are carefully monitored and test could be stopped at the onset of any adverse effects.

Our patients were tested 6 days after AMI on a low level treadmill test and were discharged from hospital. This reflects the tendency toward the early discharge after AMI.However discharge as early as 5 days after AMI has been reported from Britain 8'9'1 .

Fatigue was the most common reason for not completing the test (2 out of 12 patients). This was in agreement with the finding of Ibsen and his colleagues who reported patient fatigue as the reason for discontinuing the test in 58% of their patients.

Fatigue had been documented as being the most common subjective complaint occurring after AMI .12-'3-14. Chest pain occurred only in 4 percent (2 out of 50 patients) in our study whereas an incidence of 20 percent was reported in another study6 . The difference may be due to the more strenuous exercise performed by subjects in that study. When resting heart rates, systolic diastolic blood pressure of group 1 were compared with those of group 2, the later was significantly different (p<0.05). This suggests that patient with higher resting heart rate, systolic, diastolic blood pressure had a decreased capacity for exercise.

The findings of ST-segment changes during exercise early after AMI have been reported by other investigators6'7'14 . Nixion et al 15'17 reported myocardial ischemia (chest pain and or significant ST segment changes) in 34 (56%) patients during exercise.In our study 7 out of 50 patients (14%) had myocardial ischemia during the test, the higher percentage of patients in previous study who showed myocardial ischemia suggest that the previously described test were strenuous than ours.

The incidence of minor arrhythmia in two out of 50 patints (4 percent) is considerably lower than that in previous studies (42 percent)15,17 . Again this was probably due to the lower level of testing in our study.

In conclusion the low level treadmill testing is safe if carried out under care and attendance of expert medical professional. The test provide available information about the patient's condition which can be very useful for the patients on the day of discharge from hospital.

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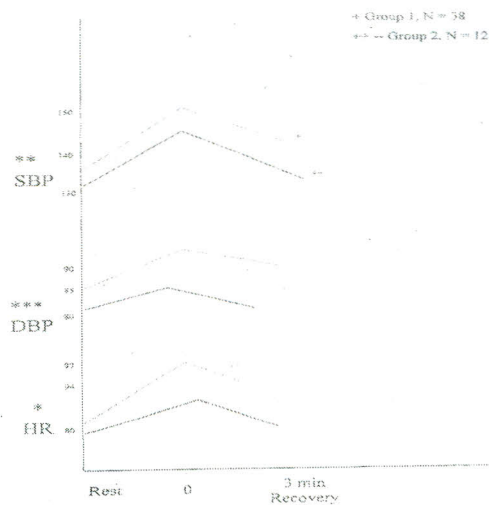17-   Jelink VM, Ziffer Rw. Early Exercise testing and mobilization after MI. Med J 1977; 2:589-598.

Fig. 2 Comparison between heart rate (*HR), systolic blood pressure (**SBP) and diastolic Blood Pressure (***DBP) of the 38 patients who completed the test (group 1) and 12 who do not finish the test (group 2)
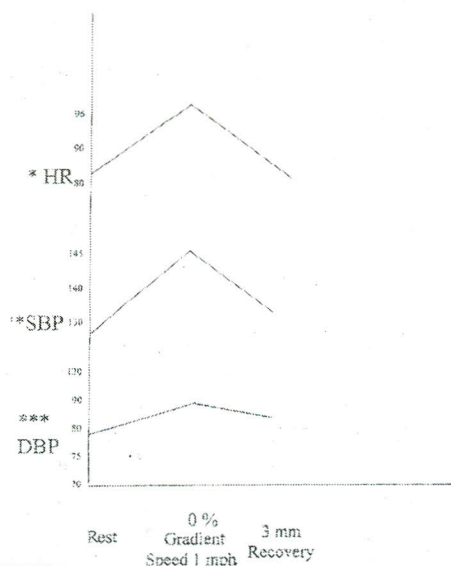

Fig. 1 Diastolic Blood Pressure ***(DBP), Systolic Blood pressure**(SBP) , Heart rate* (HR) during low level treadmill testing (mean and standard error)