

Association between activity at onset of symptoms and complications of ST-segment elevation myocardial infarction in Erbil teaching hospital

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Abstract

Background and objectives: It is controversial whether the onset of myocardial infarction occurs randomly or is precipitated by identifiable stimuli. The aim of this study is to emphasise the relationship of exercise, rest and bed related onset ST-segment elevation myocardial infarction with subsequent in-hospital complications.

Methods: The study has been done perspective having collecting data from those patients whom had been admitted from 1st of November 2008 till 1st of June 2009 to the Coronary Care Unit (CCU) in Hawler Teaching Hospital in Erbil city. The study had included one hundred twenty one patients (84 men, 37 women) whom they exhibited a newly developed ST-segment elevation myocardial infarction (STEMI) over the chronological age ranged from (35-86), mean age (56.76±11.12). Transthoracic echocardiography had been employed over 88 recently admitted patients whose in-hospital complications were precisely being clarified and recorded. The onset of pain of acute myocardial infarction whether during exercise, rest or during sleep (bed) has been verified and studied.

Results: Patients whose symptoms of STEMI began at rest, or bed had higher incidence of early acute mitral regurgitation (26, 59.1%), (13,65%) respectively versus exercise related STEMI onset(8,33.3%)p value=0.04.

Conclusion: Early echocardiographic examination is recommended especially to patients having had physical body rest in order to detect early bed-related onset STEMI and to diagnose complications like acute mitral regurgitation.

Key words: Activity, Acute myocardial infarction.

Introduction

It is controversial whether the onset of acute myocardial infarction (AMI) occurs randomly or is precipitated by identifiable stimuli, it is not known whether pathophysiology of exercise, non exercise or sleep related AMI is the same. ¹ A causal relationship between stress and atherosclerosis has not yet been demonstrated in clinical studies². Throughout this century, the possible association of external stimuli with the onset of AMI has been debated³. Among the factors that have been suggested as precipitating AMI are strenuous physical activity and emotionally upsetting life events, some studies have suggested that cardiac events occur with

increased frequency during or within a few hours after physical exertion. ⁴ Studies of activity-related triggers of ischemia reveal a correlation between ischemia and physical activity, mental stress and support the role of increased cardiac demand as a trigger of ambulatory ischemia. ^{5,6} In patients with coronary artery disease, transient myocardial ischemia occurs during a wide range of activities, not just during strenuous exercise^{7,8}, consistent with this finding, laboratory studies have demonstrated that myocardial ischemia can be triggered by cigarette smoking, cold, mental stress and emotions such as anger.^{8,9} The aim of the present study is to clarify the relationship of exercise, rest and bed related onset ST-segment elevation

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myocardial infarction(STEMI) with early in-hospital complications.

Methods

The study has been done perspective by collecting data from those patients who had been admitted from 1st of November 2008 till 1st of June 2009 to the CCU in Hawler Teaching Hospital in Erbil city. The study included patients with first attack of STEMI, duration from onset of pain till admission to the CCU <4 hours. What activity was undertaken when or during the 30 minute before the onset of symptoms of MI were recorded, activity documented as exercise related (yes/no) if the patient was walking at their normal brisk pace or undertaking some other activity equivalent to or more than 4 metabolic equivalents¹⁰. Other patients classified as having symptoms onset in bed (Defined as chest pain of acute MI awaken the patient from sleep) or onset at rest if symptoms were not exercise related and not begin in bed, complete physical examination done for each patients. The diagnosis of STEMI was done according to the following criteria: Typical rise and gradual fall of troponin, with at least one of the following:

1- Ischemic symptoms. 2- Development of pathologic Q waves on the ECG recording. 3- ECG changes indicative of ischemia (ST-segment elevation¹¹ In hospital complications like ventricular fibrillation, ventricular tachycardia, heart block, pulmonary edema, cardiogenic shock and in hospital death had been recorded. Shock defined as the concurrence of persistent hypotension and clinical signs of low cardiac output and had been considered as cardiogenic shock after the exclusion of hypovolemia, arrhythmias, and mechanical complications¹². Two-dimensional transthoracic echocardiography had been performed for 88 out of 121 patients within 5 days of admission to the CCU using 2.5 MHz transducer, Philips (EnVisor, version 1-A,2003), the other 33 patients echocardiography couldn't done because either the patient died, poor echo window or the

patient discharged before performing echocardiography. Echocardiography complications had been recorded which include left ventricular systolic dysfunction (LVSD), pericardial effusion, left ventricular mural thrombi& MR. Ejection fraction (EF) was determined from apical two and four chamber views using the Simpson's biplane formula¹³. Left ventricular systolic dysfunction (LVSD) defined as left ventricular ejection fraction less than 50%. Patients with previous history of MI, previous angina, previous history of heart failure, valvular heart disease, left bundle branch block, and those with absolute or relative contraindication to thrombolytic therapy had been excluded from this study¹⁴. All patient received alteplase.

Statistical methods: Chi square test used for the comparism between the different groups and p value < 0.05 considered as significant, SPSS version 16.0 (statistical package for social sciences) computer system by assistant of expert statistics.

Results

The total study group consisted of 121 patient, (84 (69.4%) male, 37 (30.57%) female) patients with first STEMI who had been admitted to CCU in Erbil Teaching Hospital their ages ranged from (35 to 86) the mean ages was (56.76+/-11.12). Regarding the distribution of onset of symptoms from those 121 patient 57 (47.1%) patient develop symptoms of AMI during rest (rest onset), while 35(28.9%) patients develop onset of symptoms at exercise (exercise onset) and 29(23.9%) patients develop onset of symptoms at bed (bed onset) as shown in (Figure 1). The proportion of in hospital mortality was nearly equal for those with symptoms onset during exercise versus rest onset, exercise versus bed onset and at bed versus rest onset as shown in (Table 1,2,3). Out of 121 patients 34(28.09%) develop pulmonary edema, 5(4.13%) cardiogenic shock, 4(3.3%) VT, 3(2.47%) VF, and 5(4.13%) develop complete heart block. There was no significant difference

regarding pulmonary edema, cardiogenic shock, VT, VF and complete heart block between patients with symptoms onset in bed versus rest, symptoms onset in rest versus exercise and symptoms onset in bed versus exercise. as shown in table 4,5,6. Left ventricular systolic dysfunction diagnosed in 52 patients (39.1%), there was no significant difference between exercise onset versus rest onset, exercise onset versus bed onset and bed onset versus rest onset as shown in table 7,8,9. Acute mitral regurgitation diagnosed by 2-D -Echo ,Color Doppler study was significantly higher in those with rest related onset STEMI 26(59.1%) than those with whose symptoms began at exercise 8 (33.3%) , P=0.04.as shown in table-8. Patients whose symptoms began at bed had a significantly higher incidence of acute MR (13,65%) as compared with exercise related onset STEMI (8,33.3%) P=0.036.While the relation of acute MR between bed related onset versus rest related onset was not statistically significant as shown in table 7&9.

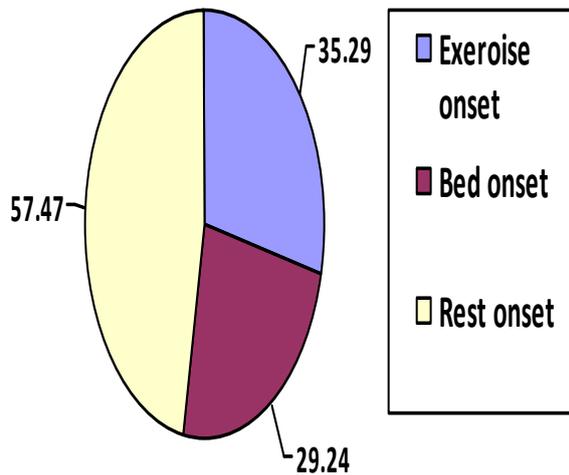


Figure 1: Distribution of patients according to the activity at onset of STEMI

Table 1: Hospital mortality in exercise onset versus rest onset STEMI

	Exercise onset (n=35)		Rest onset (n=57)		P value
	No	%	No	%	
Total hospital mortality	1	2.85	2	3.50	0.86

Table 2: Hospital mortality in exercise onset versus bed onset STEMI

	Exercise onset (n=35)		bed onset (n=29)		P value
	No	%	No	%	
In hospital mortality	1	2.85	1	3.44	0.89

Table -3: Hospital mortality in bed onset versus rest onset STEMI

	Bed onset (n=29)		Rest onset (n=57)		P value
	No	%	No	%	
In hospital mortality	1	3.44	2	3.5	0.98

Table 4: In hospital complications in bed onset versus rest onset STEMI

In-hospital complications	Bed onset (n=29)		Rest onset (n=57)		P value
	No	%	No	%	
Pulmonary edema	8	27.58	19	33.33	0.58
Cardiogenic shock	1	3.44	2	3.5	0.98
Ventricular tachycardia	1	3.44	1	1.75	0.62
Ventricular fibrillation	0	0	2	3.5	0.30
Complete heart block	1	3.44	2	3.5	0.98

Table 5: in hospital complications in exercise onset versus rest onset STEMI

In-hospital complications	Exercise onset (n=35)		Rest onset (n=57)		P value
	No	%	No	%	
Pulmonary edema	7	20	19	33.33	0.58
Cardiogenic shock	2	5.7	2	3.5	0.98
Ventricular tachycardia	2	5.7	1	1.75	0.62
Ventricular fibrillation	1	2.85	2	3.5	0.30
Complete heart block	2	5.7	2	3.5	0.98

Table 6: In-hospital complications in exercise onset versus bed onset STEMI

In-hospital complications	Exercise onset		Bed onset (n=29)		P value
	No	%	No	%	
Pulmonary edema	7	20	8	27.58	0.47
Cardiogenic shock	2	5.7	1	3.44	0.66
Ventricular tachycardia	2	5.7	1	3.44	0.66
Ventricular fibrillation	1	2.85	0	0	0.35
Complete heart block	1	2.85	1	3.44	0.89

Table 7: Echocardiographic complications of bed onset versus rest onset STEMI

Echocardiographic complications	Bed onset (n=20)		Rest onset (n=44)		P value
	No	%	No	%	
Left ventricular systolic dysfunction	11	55.0	27	61.4	0.63
Mitral valve regurgitation	13	65	26	59.1	0.65

Table 8: Echocardiographic complications in exercise onset versus rest onset STEMI

Echocardiographic complications	Exercise onset (n=24)		Rest onset (n=44)		P value
	No	%	No	%	
Left ventricular systolic dysfunction	14	58.3	27	61.4	0.8
Mitral valve regurgitation	8	33.3	26	59.1	0.04

Table 9: Echocardiographic complications of exercise onset versus bed onset STEMI

Echocardiographic complications	Exercise onset (n=24)		Bed onset (n=20)		P value
	No	%	No	%	
Left ventricular systolic dysfunction	14	58.3	11	55.0	0.82
Mitral valve regurgitation	8	33.3	13	65	0.036

Discussion

There was no significant difference in hospital mortality between exercise onset 1 (2.85%) versus rest onset 2(3.50%), exercise onset 1(2.85%) versus bed onset 1 (3.44%) and bed onset 1(3.44%) versus rest onset (2, 3.5%) STEMI which can be explained by the fact that most of the deaths associated with STEMI occur within the first hour of its onset and are usually due to VF¹⁴, and most of mortality in our patients recorded outside the CCU (death on arrival), due to delay in transporting, resuscitating and failure of prehospital thrombolytic therapy to the patients within the first hour of STEMI. ¹⁵Stewart found that prehospital cardiac arrests were increased in patients with onset related to exercise despite a better in-hospital

Outcome.¹⁶ Pekkanene J et al found that high physical activity may independently prevent premature death among middle-aged men, but it probably does not prolong the maximum achievable life-span.¹⁷ There was no significant difference in pulmonary oedema, cardiogenic shock and LVSD between patients with symptoms onset in bed versus rest, symptoms onset in exercise versus rest and symptoms onset in exercise versus bed. Our finding is to the contrary of Stewart study) which demonstrated that the proportion of patients who developed heart failure needing diuretic treatment was lowest for exercise-related onset and highest when onset of symptoms was in bed.¹⁶ The explanation for the observed difference of this study with our results regarding heart failure may be explained by the lower

number of patients in our study. Out of 121 patients, 4 (3.3%) develop VT, 3 (2.47%) develop VF and 5(4.13%) develop complete heart block and there was no significant difference regarding VT, VF and complete heart block between patients with symptoms onset in bed versus rest, symptoms onset in rest versus exercise and symptoms onset in bed versus exercise, no previous studies done about the association between activity at onset of symptoms of STEMI and arrhythmias. Patients whose symptoms began at rest had a significantly higher incidence of acute MR (26, 59.1%) as compared with exercise related onset STEMI (8, 33.3%), $P=0.05$ within the first 5 days of admission to the CCU despite early thrombolytic therapy. Patients whose symptoms began at bed had a significantly higher incidence of acute MR(13,65%) as compared with exercise related onset STEMI (8,33.3%) $P=0.036$ within the first 5 days of admission to the CCU despite early thrombolytic therapy. Acute mitral regurgitation occurs after acute MI due to several different mechanisms. The first, closely related to infarct expansion, is rupture or partial rupture of the papillary muscle.¹⁸ Tchong reported a higher incidence of triple-vessel disease, in patients with acute transmural MI complicated by moderate to severe MR than patients with acute transmural MI but without MR.¹⁹ Advanced coronary disease in patients with acute transmural MI complicated by MR was also documented by (Hickey et al and by Sharma et al, which may explain that patients with rest, bed related onset STEMI complicated by acute MR had higher incidence of triple-vessel disease than those with exercise related onset STEMI.^{20,21}

Conclusion

Early echocardiographic examination is recommended especially for those with rest,bed-related onset STEMI for the earliest diagnosis of complications like acute mitral regurgitation.

Study limitations: The study does not include patients who died before hospital admission, no clear definition of rest related onset STEMI and the role of associated tensions or stress or other psychiatric conditions.

Recommendation: Larger number of patients is needed for further assessment of the association of activity at the onset of STEMI and in-hospital complications.

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