

## ORIGINAL RESEARCH

## Short-Term Outcome of Discharged Low-Risk Chest Pain without Provoke Ischemia Study

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### Abstract

**Introduction:** Chest pain is a common problem in patients referring to emergency units. The present study was undertaken to evaluate the short-term outcome of patients presenting with a low risk chest pain and discharging without provoke ischemia study during emergency department admission. **Methods:** In the present prospective cohort study, patients with low-risk chest pain, referring to the emergency department of Imam Hossein Hospital, Tehran, during the first half of 2012, were evaluated. All the patients underwent electrocardiogram (ECG) and cardiac enzyme tests, including cardiac isoenzymes creatine kinase MB and troponin I. One week after referring to the emergency department, the patients underwent an exercise test and were followed for a month. Data were analyzed with chi-squared test at a significant level of  $P < 0.05$ . **Results:** A total of 252 patients were included. The mean and standard deviation of patient ages was  $56 \pm 7.7$  years (47.5% male). The results of exercise tests for 47 (26.3%) subjects were positive [32 (28.8%) patients in the 41-60 year age group and 15 (22.7%) over 60 years of age]. The angiography examination results of 5 patients (2.8%) were abnormal. There were no significant relationships between the age and gender and the results of exercise test and angiography ( $P > 0.05$ ). During the one-month follow-up no cases of mortality, cardiac problems, or referring again to the hospital were recorded.

**Conclusion:** Based on the results of the present study, prevalence of cardiac etiology in patients with low risk chest pain was 2.8% and one-month follow-up did not reveal any complications or serious problems in such cases.

**Key words:** Chest pain; coronary artery disease; exercise test; risk; emergency

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### Introduction:

Chest pain is a common complaint of patients referring to emergency units and might be the only symptom of a life-threatening cardiovascular problem (1). It is so important that even in atypical cases, the initial examinations are necessary to rule out a cardiac etiology (2). Studies have shown that 2-5% of patients suffering acute myocardial infarction are not properly monitored and are erroneously discharged from emergency units (3). Therefore, physicians prefer to take measures to prevent such mistakes. On the other hand, two-thirds of patients presenting with chest pain are ultimately discharged from the hospital without the need for hospitalization or a specific therapeutic intervention (4). However, a sizeable proportion of patients presenting with a chief complaint of chest pain, who have normal electrocardiogram (ECG), are finally diagnosed with acute coronary syndrome after further

evaluations (5). To prevent such problems, it is necessary to prepare systematic and standard therapeutic protocols based on which it would be possible to discharge patients with greater confidence. Initial research studies indicated that morbidity and mortality are rare in low-risk patients; therefore, such patients do not need aggressive treatment modalities and long-term hospitalization, because one-year mortality rate in such patients is approximately 3% and none of them are due cardiac reasons (6, 7). Based on the latest recommendation of American Heart Association in 2010 (8) patients with possible acute coronary syndrome could be discharged from emergency unit if they had normal serial electrocardiography, cardiac enzyme, and negative result of provoke ischemia study (for example the exercise test). Since in our country the facility of provoke ischemia study is not available in emergency departments, the low-risk patients, referring to the studied hospital clinic for further evaluation, has been discharged. Accordingly, the present study was undertaken to evaluate the short-term outcome of patients presenting with a low risk chest pain and discharging

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without provoke ischemia study during emergency department admission.

#### **Methods:**

##### **Study design and setting**

The present prospective cohort study was carried out during the first half of 2012 in patients with low-risk chest pain, referring to the Emergency Department of Imam Hossein third-level educational Hospital in Tehran. The protocol of the study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (Code: 90-1-134-8723-8303). Before the study was instituted, the patients and the people accompanying them received full explanation about the study and those wanted to be volunteer in the study, signed a consent form and were included.

##### **Participants**

The subjects in the present study consisted of patients with a chief complaint of chest pain, who had referred to the emergency department and were placed in Group IV cardiac risk (low risk) based on classification of the American Heart Association (9). The included criteria consisted of chest pain with low risk (Group IV) and normal ECG and cardiac enzymes. Excluded criteria were age >70, persistent angina, history of myocardial infarction, diabetes mellitus, history of heart failure, prior coronary revascularization within five years, hypertension, vascular disease, patients with arrhythmias and heart conduction defects, patients with permanent pacemakers and implantable cardioverter-defibrillators, pulmonary arterial disease, hypertrophic cardiomyopathy, patients with morbid obesity, pregnancy, and lack of interest in participating in the study.

##### **Data collection**

Serial evaluation of ECGs was carried out and the cardiac enzymes, including troponin I and cardiac isoenzymes creatine kinase MB, were checked. Cardiac enzymes were evaluated every six hours up to three times. In addition, ECGs were evaluated whenever chest pain recurred. The age, gender, marital status, occupation, living place, and phone number of patients were questioned and registered. They were asked to refer to the exercise test unit of Imam Hossein Hospital during one week after discharging. When the patients returned to the exercise test unit they were asked about the incidence of cardiac symptoms and signs, recurrence of chest pain or referring to the treatment center again. After the exercise test, the results were collected and patients with positive test underwent angiography. Then, the patients were followed for a month. At the time of discharge, the patients or their relatives received instructions in relation to the symptoms and signs of cardiac diseases.

##### **Endpoints**

Primary endpoints of the study were cardiac etiology of chest pain and mortality during the first week of follow up. Also, secondary endpoints were defined as the occurrence of any dysrhythmia, the recurrence of chest pain, cardiac problem, requiring coronary intervention, and repeated emergency department presentation with a complaint of chest pain or other hospitalization as well as mortality during follow-up period.

##### **Statistical analysis**

Sample size was determined based on the prevalence of cardiovascular complications in patients presenting with low-risk chest pain. Since, the lowest prevalence of cardiovascular complications in these patients was 0.2% (19), the minimum samples size was calculated to be 120 subjects by considering  $\alpha=0.05$  and a power of 90% ( $\beta=0.1$ ). Data were analyzed using SPSS 21.0. After descriptive evaluation of data, chi-squared and Fisher's exact tests were used to evaluate the outcome of patients. Statistical significance was defined as  $p < 0.05$ .

##### **Results:**

A total of 252 patients were included in the present study, with 179 (71.0%) returning to the exercise test unit of Imam Hossein Hospital after a week. The mean and standard deviation of patient ages was  $56 \pm 7.7$  years (47.5% male). The majority of patients were high school graduates (45.0%).

##### **Patient outcomes**

Of 179 patients referring to the exercise test unit, 47 patients (26.3%) had positive test results [22 (25.9%) male and 25 (26.6%) female]. Statistical analysis did not reveal a relationship between age ( $P=0.4$ ) and gender ( $P=0.91$ ) of the patients and the results of exercise test. No positive exercise test results were observed in the 20-40-year age group. However, 32 patients (28.8%) in the 41-60-year age group and 15 patients (22.7%) over 60 years of age had positive exercise test results (Table 1). The angiography results of 5 patients (2.8%) were abnormal. There was no significant relationship between age ( $p=0.52$ ), gender ( $p=0.22$ ), occupational status ( $p=0.17$ ), and educational level ( $p=0.13$ ) with the results of angiography.

One-month follow-up of patients referring to the exercise test unit showed that there were no complications, such as pain with cardiac origin, infarction, mortality, and dysrhythmia. In addition, 73 patients, not referring to the exercise test unit, were followed. Sixty-one of these patients (83.6%) reported that their chest pain had subsided without recurrence. However, 12 patients (16.4%) reported the recurrence of chest pain without hospital re-admission.

##### **Discussion:**



**Table 1:** Patients' demographic data stratified by exercise test [↑](#)

Variable	Negative	Positive	P
	Number (%)	Number (%)	
<b>Age</b>			
20-40	2 (100.0)	0 (0.0)	0.47
41-60	79 (71.2)	32 (28.8)	
>60	51 (77.3)	15 (22.7)	
<b>Gender</b>			
Male	63 (74.1)	22 (25.9)	0.91
Female	69 (73.4)	25 (26.6)	
<b>Occupation</b>			
Housewife	38 (71.7)	15 (28.3)	0.76
Employee	37 (75.5)	12 (24.5)	
Self-employed	42 (77.8)	12 (22.2)	
<b>Education level</b>			
High school	26 (66.7)	13 (33.3)	0.34
High school graduate	54 (71.1)	22 (28.9)	
Academic	43 (79.6)	11 (20.4)	

The results showed that more than a quarter of disposed patients (26.3%) based on the study protocol had positive provoke ischemia study (exercise test) on one-week follow up and 2.8% of them had positive cardiac angiography findings. None of them exhibited life-threatening complications during a one-month follow-up. It can be concluded that, in spite of sizeable number of positive exercise tests in low-risk patients, cardiac etiology has a low prevalence. The results of the present study are consistent with those of other studies. They showed a low prevalence rate of cardiac etiology in patients with low-risk chest pain. For example, Brush et al. concluded that only 6% of patients presenting chest pain and normal ECG developed life-threatening complications (10). Also, the results of a study by Kelly et al. indicated a low prevalence rate of cardiac outcomes in such patients (11). Amsterdam et al. did not report any case of mortality during a one-month follow-up in patients whose exercise test results were negative; they reported only one case of myocardial infarction (0.01%). In addition, in patients with positive exercise test results four cases (0.04) of myocardial infarction and 12 cases (0.12) of myocardial revascularization were observed (2). Holly et al. reported that patients with a moderate risk, compared to low-risk patients, exhibited higher rates of myocardial infarction, stenting, coronary artery bypass graft (CABG), and hospitalization (12). The results of long-term studies were not significantly different from those of the present study. For example, a six-month follow-up in a study by Meyer et al. showed that the etiology of 98% of patients presenting with chest pain was non-cardiac (13), con-

sistent with the results of other studies (14, 15). A study by Hollander et al. showed that the prevalence of a cardiac etiology in low-risk patients was 15%; however, despite the high prevalence of cardiac etiology, no deaths or serious complications were reported. The researchers concluded that even if the cardiac etiology prevalence in low-risk patients is high in relation to the incidence of cardiac complication, the incidence of life-threatening complications would be very rare (16). Based on what was discussed, it is hypothesized that the incidence of serious complications in low-risk patients with chest pain is rare and it might be possible to discharge such patients without therapeutic intervention. However, the risk of myocardial infarction should not be overlooked in such cases; because there is a high risk for silent myocardial infarction in young patients with atypical symptoms and signs without a history of angina or coronary heart disease (17-21).

#### Conclusion:

Based on the results of the present study, the prevalence of cardiac etiology in low-risk patients, presenting with chest pain, was 2.8% and a one-month follow-up did not reveal any serious problems and complications in such cases.

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All authors passed four criteria for authorship contribution based on recommendations of International Committee of Medical Journal Editors.

#### References:

- Nasrallah N, Steiner H, Hasin Y. The challenge of chest pain in the emergency room: now and the future. *Eur Heart J*. 2011;32:656.
- Amsterdam EA, Kirk JD, Bluemke DA, et al. Testing of Low-Risk Patients Presenting to the Emergency Department With Chest Pain A Scientific Statement From the American Heart Association. *Circulation*. 2010;122(17):1756-76.
- Savitz SI, Caplan LR, Edlow JA. Pitfalls in the diagnosis of cerebellar infarction. *Acad Emerg Med*. 2007;14(1):63-8.
- Goodacre S, Cross E, Arnold J, Angelini K, Capewell S, Nicholl J. The health care burden of acute chest pain. *Heart*. 2005;91(2):229-30.
- Moe KT, Wong P. Current trends in diagnostic biomarkers of acute coronary syndrome. *Ann Acad Med Singapore*. 2010;39(3):210-5.
- Potts S, Bass C. Psychosocial outcome and use of medical resources in patients with chest pain and normal or near-normal coronary arteries: a long-term follow-up study. *Q J Med*. 1993;86(9):583-93.
- Wielgosz AT, Fletcher RH, McCants CB, McKinis RA, Haney TL, Williams RB. Unimproved chest pain in patients with



- minimal or no coronary disease: a behavioral phenomenon. *Am Heart J*. 1984;108(1):67-72.
8. Lloyd-Jones D, Adams RJ, Brown TM, et al. Heart disease and stroke statistics—2010 update A report from the American Heart Association. *Circulation*. 2010;121(7):e46-e215.
9. Tintinalli JE, Stapczynski JS, Ma OJ, Cline D, Cydulka R, Meckler G. Tintinalli's emergency medicine: a comprehensive study guide: McGraw-Hill Medical; 2011. p. 392.
10. Brush Jr JE, Brand DA, Acampora D, Chalmer B, Wackers FJ. Use of the initial electrocardiogram to predict in-hospital complications of acute myocardial infarction. *N Engl J Med*. 1985; 313(11):692-4.
11. Kelly A-M. What is the incidence of major adverse cardiac events in emergency department chest pain patients with a normal ECG, Thrombolysis in Myocardial Infarction score of zero and initial troponin $\leq$  99th centile: an observational study? *Emerg Med J*. 2013;30(1):15-8.
12. Holly J, Hamilton D, Bledsoe J, et al. Prospective evaluation of the treatment of intermediate-risk chest pain patients in an emergency department observation unit. *Crit Pathw Cardiol*. 2012;11(1):10-3.
13. Meyer MC, Mooney RP, Sekera AK. A critical pathway for patients with acute chest pain and low risk for short-term adverse cardiac events: role of outpatient stress testing. *Ann Emerg Med*. 2006; 47(5):427-35.
14. Lai C, Noeller TP, Schmidt K, King P, Emerman CL. Short-term risk after initial observation for chest pain. *J Emerg Med*. 2003;25(4):357-62.
15. May JM, Shuman WP, Strote JN, et al. Low-risk patients with chest pain in the emergency department: negative 64-MDCT coronary angiography may reduce length of stay and hospital charges. *Am J Roentgenol*. 2009;193(1):150-4.
16. Hollander JE, Litt HI, Chase M, Brown AM, Kim W, Baxt WG. Computed Tomography Coronary Angiography for Rapid Disposition of Low-risk Emergency Department Patients with Chest Pain Syndromes. *Acad Emerg Med*. 2007;14(2):112-6.
17. Thygesen K, Alpert JS, Jaffe AS, et al. Third universal definition of myocardial infarction. *J Am Coll Cardiol*. 2012;60(16):1581-98.
18. Toma M, Fu Y, Ezekowitz JA, et al. Does silent myocardial infarction add prognostic value in ST-elevation myocardial infarction patients without a history of prior myocardial infarction? Insights from the Assessment of Pexelizumab in Acute Myocardial Infarction (APEX-AMI) Trial. *Am Heart J*. 2010;160(4):671-7.
19. Davis TM, Coleman RL, Holman RR. Prognostic Significance of Silent Myocardial Infarction in Newly Diagnosed Type 2 Diabetes Mellitus Clinical Perspective United Kingdom Prospective Diabetes Study (UKPDS) 79. *Circulation*. 2013;127(9):980-7.
20. Arenja N, Mueller C, Ehl NF, et al. Prevalence, Extent, and Independent Predictors of Silent Myocardial Infarction. *Am J Med*. 2013;126(6):515-22.
21. Valensi P, Lorgis L, Cottin Y. Prevalence, incidence, predictive factors and prognosis of silent myocardial infarction: a review of the literature. *Arch Cardiovasc Dis*. 2011;104(3):178-88.

