

Time Delay Factors in Early Management of Acute Myocardial Infarction in Shiraz University Hospitals

M. J. Zibae Nezhad, M.D. and R. Salahi, M.D.

Abstract

Objective- The aim of this study was to evaluate delay factors leading to late arrival at hospital after the onset of a chest pain and delays to start thrombolytic therapy in Shiraz University Hospitals, which may increase mortality and morbidity rates after myocardial infarction and compare these times with those in other countries.

Methods- Time delays in 212 patients diagnosed as acute coronary syndrome were investigated as the delay between the onset of the symptom and seeking help (period one: patient's time); the time between seeking help and transfer to hospital (period 2: transport time); and the period between the first medical diagnosis and the start of thrombolytic therapy or other interventions or transferring factors to the coronary care unit (period 3: arrival at hospital).

Results- The mean time in period one was 47.12 minutes, which was dependent upon the denial on the part of the patient and his/her family and the start of self-medication by the patients who wished to wait and see if the symptoms would disappear. The mean time in period 2 was 46.36 minutes, which was dependant upon whether the ambulance, public or personal transportation was used by the patients and also the whereabouts of the patients. The mean time in period 3 was 44.16 minutes, which was dependent upon the availability of health care professionals and well-trained doctors in emergency departments of the university hospitals.

Conclusion- Period one can be reduced by educating patients; period 2 can be scaled down by providing more ambulances and emergency care units in different areas of Shiraz; and period 3 can be lessened by providing better-trained doctors and starting thrombolytic therapy in the emergency department (*Iranian Heart Journal 2004; 5(4):6-12*).

Key words: myocardial infarction ■ time delay ■ Shiraz ■ Iran

Coronary artery disease is one of the most common causes of mortality and morbidity in many countries. In the United States, each year 1.5 million people develop myocardial infarction, and 1/3 of them die. Among the remaining 2/3, 60% suffer from complications of recurrent myocardial infarction.¹

In many studies, the major contraindication to starting thrombolytic therapy in a hospital is late arrival after the onset of symptoms. Arrhythmia, which is the leading cause of death in acute onset myocardial infarction, occurs in the early minutes and hours of acute infarction and can be easily treated or perhaps prevented.

From the Department of Internal Medicine, Cardiovascular Research Center, Nemazi Hospital, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran.

Correspondence to: M.J. Zibaenezhad, M.D., A.F.A.C.A., P.O. Box: 71935-1161, Cardiovascular Research Center, Nemazi Hospital, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran.
Tel: (+98711) 2307594

Furthermore, many studies have shown that approximately 50% of patients do not enter emergency medical system.^{2,3,4}

After the development of coronary thrombolytic therapy in 1980, attention was focused on increasing the capillary flow after the onset of chest pain. Studies showed that thrombolytic agents would yield maximum benefit when used as soon as possible after thrombotic coronary occlusion. Consequently, delay in early management is very important in the overall outcome. The longest component of pre-hospital delay is determined by the patient. Median delays from the symptom onset to reach a decision or to call for help have been reported as 27, 40, 45, 52, 60, 66, 80, 90, 126 and 300 minutes in different trials.^{5,6}

Female gender and advanced age seem to delay patients' calling their general practitioner compared to those who summon an ambulance (a median of 70 minutes versus 40 minutes).^{7,8,9}

The other period is delays in the arrival of medical help; this time refers to medical assistance reaching the patient with suspected myocardial infarction. General practitioners can respond rapidly, even shorter delays have been reported where there is special interest in pre-hospital coronary care.¹⁰

The response time of ambulances, particularly in an urban community, is likely to be quicker. In the 16 countries participating in the European Myocardial Infarction Project, the first 2077 patients received attendance by the mobile coronary care unit with a median delay of 20 minutes. In the UK, ambulances attending emergency calls were able to reach patients in densely populated areas in less than 10 minutes.¹¹

It is now well recognized that the delay to thrombolytic therapy after arrival in a hospital is often substantial. Patients transferred from an emergency department to a cardiac care unit before receiving

thrombolytic agents experience their greatest delay (median 85-120 minutes). Those who receive thrombolysis after direct admission to cardiac care unit feel better, and those whose thrombolysis is given in the emergency department have the shortest recorded delays to treatment (15-30 minutes).^{12,13}

In the Newby et al. study in 1996, it was shown that thrombolytic therapy within one hour after symptoms was accompanied with 5-6% mortality within 30 days, but for those patients who receive it after 4 hours, mortality is 6-8 % within 30 days.¹⁴

Other studies have shown that delay is more common in aged patients and also women compared to men.^{15,16} Also, those patients who lived alone have longer delays compared to those who live with family members. Patients who have experienced coronary artery disease arrive at the emergency department sooner than others. Delay is also greater in those who reach hospitals between 6:00PM to 6:00 AM. Ambulances are very helpful in decreasing the transfer time, especially when the ambulance is equipped with a defibrillator.¹⁶

Materials and Methods

Two-hundred and twenty-eight patients who referred to the hospitals affiliated to Shiraz University of Medical Sciences and were diagnosed as unstable angina or myocardial infarction entered our study. Information was provided on special sheets after interviews of patients by nurses and physicians. Data on gender, age, place of living, experience of coronary artery disease and literacy were recorded.

The notes were evaluated according to the time of arrival in CCU and emergency department, risk factors (diabetes mellitus, smoking, hypertension, hyperlipidemia), final diagnosis (myocardial infarction or unstable angina) and the time of thrombolytic therapy.

Time delays were divided into 4 categories:

1. Patients' delay (period 1): time between the onset of chest pain and the transfer of the patients.
2. Transport delay (period 2): time to reach hospital.
3. Hospital delay (period 3): time between arrival at hospital, which consisted of reception, admission, diagnosis and first aid, up to starting thrombolytic therapy.
4. Thrombolytic therapy time (period 4): the sum of previous time delays, consisting of the onset of symptoms and transfer time, arrival at hospital and delays in starting thrombolytic therapy.

Results

The minimum patients' delay (period 1) was 5 minutes and the maximum was 600 minutes, with a mean time of 47.12 minutes (SD±91.13). The minimum transport delay (period 2) was 5 minutes and the maximum was 390 minutes, with a mean time of 46.35 (SD±58.5, Table I).

Table I: Transportation time in 212 patients with chest pain.

	No of PTS	Minimum Time	Maximum Time	Mean	SD
Period 1	212	5 min	600min	47.12 min	±91.13
Period 2	212	5 min	390 min	46.35 min	±58.50
Period 1 + Period 2	212	10 min	720 min	93.47 min	±114.84
Period 1 + Period 2 + Period 3	212	5 min	360 min	44.16 min	±46.68
Time to ER	212	1hr	144 hrs	13.5 hrs	±23.75
Time from symptoms to CCU (period 1-3)	212	1.4 hrs	147.6hrs	15.7hrs	±23.76

The minimum hospital delay (period 3) was 5 minutes and the maximum was 360

minutes, with a mean of 44.16 (SD±46.68) minutes.

The minimum thrombolytic therapy time (period 4) was 20 minutes and the maximum was 1080 minutes, with a mean time of 137.64 minutes (SD±139.1 minutes).

One-hundred and twenty (56.6%) of the patients were male and 92 (43.4%) were female. Period one for men and women was 32.45 minutes and 66.14 minutes, respectively, which was statistically significant (P<0.008).

Twenty-seven males (22.5%) and 21 females (22.8%) were transferred to hospital by ambulance. Also, 82 males (68.3%) and 56 females (60.9%) used private cars, and 11 males (9.2%) and 15 females (16.3%) used public transportation to hospitals (Table II).

Table II: Number and percentage of patients using different transportation.

Type of transportation system	No of patients	Percent
Ambulance	48	22.6
Private car	138	65.1
Public car	26	12.3
Total	212	100

Seventy-one (36.8%) patients were below 55 years of age, and 134 (63.2%) were above 55 years old. No statistical difference was found between the above groups in period one, period 2 and period 3.

Eighty-seven (41%) patients were illiterate or semi-literate; 70 patients were (33%) below high school level, and 55 patients (25.9%) were above high school level.

Period one in illiterate and semi-literate patients was 71.95 minutes, while among those lower than high school level and those above high school level it was 30 minutes and 29.64 minutes, respectively. Longer delays were observed among illiterate and semi-illiterate patients (P=0.05). Also, period 2 among illiterate and semi-literate patients was much longer

in comparison with the 2 other groups (P=0.05, Table III).

Table III: Mean time in 3 groups of patients: illiterate or semi - literate, below high school and above high school levels of education with typical chest pain.

Level of Education	No. of patients	Period 1	Period 2
illiterate or semi-literate	87	71.95 min	128.7 min
Below high school level	70	30 min	70.64 min
Above high school level	55	29.64 min	66.82 min

One-hundred and nine (51.4%) patients had first-time hospitalization due to coronary artery disease. No statistical difference was observed between the 2 groups. Also, according to T-test, no statistically significant difference was seen between period one, 2 or 3 in these 2 groups.

One-hundred and fifty-six (73.6%) patients lived in Shiraz at the beginning of chest pain, and 56 (26.4%) patients lived outside of Shiraz. No statistical difference was seen in relation to using ambulance, public or private transportation in both groups; however, while the mean time in period one in group one was 35.32 minutes, it was 80 minutes in group 2 (P<0.0021). In addition, period 2 in the group living in Shiraz was 25.49 minutes, whereas in group 2, it was 104.46 minutes (P<0.001).

One-hundred and thirty-four (63.2%) patients had unstable angina in hospital. There were statistically significant differences between both groups in period one and period 2 (Table II). Delay in both periods was greater in MI in comparison with unstable angina patients. Fifty percent of the patients with MI received thrombolytic therapy, and 31 of them received it within the golden time (below 6 hrs).

Discussion

The most important period is patients' delay, which consists of factors such as ignorance of pain, family members' behavior, marital status, living in old people's homes, history of hypertension, heart failure, the time of the onset of chest pain, typical and or atypical chest pains and any history of coronary artery diseases.¹⁷

The mean time in period one in our study was 47.12 minutes, while in More's study (1995) it was 60 minutes. The sum of period one and period 2 in our study was 93.48 minutes, similar to that in More's study (95 minutes).¹⁸

In our study, most patients received thrombolytic therapy in the emergency room (just after diagnosis). This time in More's study was 142 minutes, but in Coccolini's trial⁽⁹⁾, it was reduced to 90 minutes and in Dalton's study,²⁰ it was reduced from 141 minutes to 61 minutes. This time in our study was 137.64 minutes, which was the sum of the 3 periods, partly related to hospital staff and nurses' behavior. This time, considered as the golden time for coronary patients, must be reduced in our university hospitals in future programs. The time from the beginning of chest pain to hospital admission in our study, 93.48 minutes, was statistically significant between those with MI and those with unstable angina. The delay for patients with MI was 113 minutes, and in More's study it was 95 minutes.¹⁸ In our study, thrombolytic therapy was started in the emergency room before the patients were transferred to CCU. The mean time for hospitalization in CCU was 13.5 hrs. The most important factor for this delay was a lack of available CCU beds at the time of this study (2002-2003). If our emergency rooms had had better monitors and better-trained nurses and doctors, the mortality and morbidity

rates would have been the same as those in CCU or even less.

From 2409 patients with myocardial infarction in a study in the United States in 1992, 42% used ambulances as transportation.¹¹ In More's study in 1995, 60% patients used special ambulances equipped for coronary patients. In our study, only 48 patients (22.6%) selected ambulances for transfer to hospital. Most of our patients (65.1%) used private cars. Of course, using private cars reduced time delays, but if our ambulances had been equipped with defibrillators and monitors with nurses familiar with CRP, the mortality rate would have been reduced in the first hours of acute coronary syndrome. In Mishlse's study in 1995, use of ambulances for transfer of acute coronary syndrome patients was low for 2 reasons: first, the patients believed that their symptoms were not very important to call for an ambulance, and second, most patients believed that private cars would reduce the time to reach hospital.²¹ The mean time in transport with ambulances in our study was 36.98 minutes, 38.8 minutes for private cars and 110 minutes for public transport, which was significantly different between the 2 previous ones.

No statistical difference was seen between males and females in relation to using ambulances and private cars, but the female group used public transportation more in our study. However, there was a significant difference between males and females for period one and two. Our results showed that the elements of "denial" and "ignorance" were more common among males; however, fear of hospital, use of public transportation and economic problems were other factors causing delays. In our study, no statistical difference was observed in relation to using different transportation in patients below and above 55 years old. Also, no difference was visible in time delays in these 2 groups.

We think that this factor is not important in the decision of patients; however, the level of literacy is more important in choosing the means of transportation in periods one and 2, where illiterate and semi-literate patients had longer delays.

History of previous CCU admission did not affect delays, nor did the type of vehicles used, indication that our nurses and health care staff were not involved in secondary prevention and in reducing these delays.

Time delay in patients living out of Shiraz showed that special attention must be focused on the use of mobile CCU's or emergency rooms in those areas.

In our study, only 50% of MI patients received thrombolytic therapy; and of these, 31 patients received it in the golden time (below 6 hrs), most of them living in Shiraz. More research is needed to investigate thrombolytic therapy in our area.

Conclusion

Delays in acute coronary patients were within acceptable ranges compared with those in other studies, especially in European countries and America. Literacy, sex difference and place of residence significantly affected these delays; nevertheless, more education is needed to reduce periods one and 2.

How to educate the public in order to reduce these delays requires another investigation, but it was confirmed that better-trained nurses and professional health care staff are needed to reduce thrombolytic time.

Also, in our future program, these delays must be reduced by using equipped ambulances with trained staff so that mortality can be reduced in the first hours after myocardial infarction.

Acknowledgements

The authors would like to thank the Office of vice-chancellor for research of Shiraz University and Dr. Davood Mehrabani, the Center for Development of Clinical Studies of Nemazee Hospital for editorial assistance.

References

- Ganz P, Gand W. Coronary blood flow and myocardial ischemia. In Braunwald Heart Disease. 6th edition, Philadelphia, W. B. Saunders Co., Chapter 34.
- Lavie CJ, Gersh Bj and Chesebro JH: Reperfusion in acute myocardial infarction. Mayo Clinic Proc. 1990; 549-563.
- Yusuf S, Collins R, Peto R, et al: Intravenous and intracoronary fibrinolytic therapy in acute myocardial infarction: overview of results on mortality, reinfarction and side-effects from 33 randomised controlled trials. Eur Heart Journal 1985; 6: 556-585.
- Turi ZG, Stone PH, Muller JE, et al: Implications for acute intervention related to time of hospital arrival in acute myocardial infarction. Am J Cardiol 1986; 58:203-9.
- Great group: Feasibility, safety, and efficacy of domiciliary thrombolysis by general practitioners: Grampain Region Early Anistreplase Trial, BMJ 1992; 305; 548-53.
- Weaver DW, Cerqueira M, Halstrom AP, et al: Pre-hospital initiated vs. hospital-initiated thrombolytic therapy. The myocardial infarction and triage intervention trial. JAMA 1993; 270: 1211-16.
- Dracup K, Moser DK, Eisenberg M, et al: Causes of delay in seeking treatment for heart attack symptoms. Soc Sci Med 1995; 40:379-92.
- Ell K, Haywood LJ, Sobel E, et al: Acute chest pain in African Americans: factors in the delay in seeking emergency care. Am J Public Health 1994; 84: 965-70.
- Bleeker JK, Simoons ML, Erdman RA, et al: Patient and doctor delay in acute myocardial infarction: a study in Rotterdam, the Netherlands. Br J Gen Pract 1995; 45: 181-4.
- R Vincent: Management of acute myocardial infarction. In: Braunwald E, Desmond J.(eds.) Heart Disease. Philadelphia, W. B. Saunders Co., 1994; pp. 3-23.
- European Myocardial Infarction Projected Group: Pre-hospital thrombolytic therapy in patients with suspected acute myocardial infarction N Engl J Med 1993; 329: 383-9.
- Birkhead JS: Time delays in provisions of thrombolytic treatment in six district hospitals. BMJ 1992; 305:445-8.
- Schofer, J, Buttner, J, Geng Gutschmidt K, et al: Pre-hospital thrombolysis in acute myocardial infarction. Am J Cardiol 1990; 66: 1429-33.
- Newby LK, Rutsch WR, Califf RM, et al: Time from symptom onset to treatment and outcomes after thrombolytic therapy. GUSTO-1 investigators. J Am Coll Cardiol 1996; 27: 1646-55.
- Yarzebski J, Goldbertg RJ, Gore JM, et al: Temporal trends and factors associated with extent of delay to hospital arrival in patients with acute myocardial infarction. The Worcester Heart Attack study. Am Heart J 1994; 128: 255-63.
- Udvar Helyi IS, Gastonis C, Epstein AM et al: Acute myocardial infarction in the medicare population. Process of care and clinical outcomes. JAMA 1992; 268: 2530-6.
- Olin HS, Hacket TP: The denial of chest pain in 32 patients with acute myocardial infarction. JAMA 1964; 190: 977-82
- More R, Morre K, Quinn E, et al: Delay times in the administration of thrombolytic therapy: the Brighton experience. Internat J Cardiol 1995; 49: 39-46.
- Coccolini S, Berti G, Bosi S, et al: Pre-hospital thrombolysis in rural emergency room and subsequent transport to a coronary care

unit: Ravanna myocardial infarction trial.
Internat J Cardiol 1995; 49: 47-58.

20. Dalton H, Chappel D, Climie R, et al: Thrombolysis for acute myocardial infarction in a District General Hospital. J Royal Soc Med 1989; 82: 349-5.
21. Mishlase H, Eisenberg MS, et al: Reasons patients with chest pain delay or do not call 911. Ann Emerg Med 1995; 25: 193-7.