Original Article

Changing Trends in the Management of Acute Myocardial Infarction: A Five-Year Study

Ibrahim Lasheen[1], Mohammed Zubaid[2], Cheriyil G Suresh[1], Hanan El Sayed Bader[3]
[1]Department of Medicine, Mubarak Al Kabeer Hospital, Kuwait
[2]Department of Medicine, Faculty of Medicine, Kuwait University, Kuwait
[3]Department of Public Health, Faculty of Medicine, Kuwait University, Kuwait

Kuwait Medical Journal 2006, 38 (3): 207-210

ABSTRACT

Background: Over the past two decades, there has been considerable progress in the treatment of acute myocardial infarction (AMI) that led to substantially lower mortality and morbidity. Therefore, we carried out this study to evaluate the changes in our practice as related to AMI treatment over a five year period.

Patients and Methods: This is a retrospective analysis that included all patients with a diagnosis of AMI, admitted to the coronary care unit between the first of January 1998 and the end of December 2002.

Results: The total number of patients with AMI was 2,280. Comparing the first year to the last year of the study, the use of medications at discharge increased significantly for beta-blockers (76 vs 88, $p < 0.0001$); for angiotensin converting enzyme inhibitors (ACEI) (40 vs 45%, $p = 0.02$) and for lipid lowering drugs (25 vs 66%, $p < 0.0001$). Similarly, the use of thrombolytic drugs increased significantly (60 vs 66%, $p < 0.001$). The time to administration of thrombolytic treatment shortened significantly (104 vs 70 minutes, $p < 0.001$). The use of in-hospital cardiac catheterization increased as well (7 vs 14%; $p = 0.006$).

Conclusions: Our study showed significant changes in the practice of AMI treatment over the five year study period. The use of therapies with proven benefit such as beta- blockers, ACEI, lipid lowering drugs, thrombolysis and in-hospital cardiac catheterization has increased. Although the time to thrombolytic treatment did shorten, it needs to be shortened further to obtain the maximum benefit from such therapy.

KEYWORDS: acute myocardial infarction, practice pattern, thrombolysis

INTRODUCTION

Coronary artery disease (CAD) is a major health problem in Kuwait. In 1995, CAD was responsible for death in 15.4% Kuwaitis and 23.6% expatriates[1]. One of the means of fighting CAD is the provision of evidence-based therapies to patients diagnosed with CAD. Despite the presence of enormous amount of data supporting the use of certain therapies, proven therapies continue to be underutilized[2-6]. One of the facets of CAD is acute myocardial infarction (AMI). The use of different therapies in AMI has been studied extensively in western countries[7-12]. We aimed to evaluate our own practice, as it relates to AMI treatment over a five year period.

METHODS

The data for this retrospective study were collected from the computerized database of the coronary care unit (CCU) at Mubarak Al Kabeer Hospital, a 476-bed teaching hospital that provides service to almost 450,000 residents in the Hawally Governorate. All patients with AMI who were admitted to the CCU between January 1998 and December 2002 were included in the study. The diagnosis AMI was based on any two of the three following criteria: ischemic type chest pain, diagnostic serial ECG changes (ST-segment elevation and non ST-segment elevation) and two-fold rise in total creatinine kinase (CK) with MB fraction contributing at least 3% of the total CK level. Troponin assay was not routinely done between 1998 and 2002 in our institution. Patients were eligible for thrombolytic therapy, if they presented within 12 hours and had acute ST-segment elevation (> 0.1 mV in two or more limb leads, or > 0.2 mV in two or more contiguous precordial leads) or a new LBBB on the admission ECG.

The variables analyzed from the database included detailed information on medical history,

Address correspondence to:
Dr. Ibrahim Lasheen, FRCP (UK), Department of Medicine, Mubarak Al Kabeer Hospital, P.O. Box 48707, Kuwait. Tel: (965) 6520825, Fax: (965) 5338907, E-Mail: ibraheemlasheen@hotmail.com

Table 1 : Baseline patients' characteristics

	1998 N=424	1999 N=436	2000 N= 486	2001 N=462	2002 N=472	P-value
Male	362 (85)	393 (90)	399 (82)	402 (87)	413 (88)	NS
Mean age	54.4 ± 11.6	54.1 ± 11.2	54.9 ± 12	54.9 ± 11.4	54.9 ± 12.3	NS
Smoker	228 (54)	222 (51)	229 (47)	228 (49)	226 (48)	NS
Diabetes	143 (34)	168 (39)	208 (43)	173 (37)	182 (39)	<0.0001
Hypertension	131 (31)	117 (27)	169 (35)	147 (32)	172 (36)	=0.02
Hypercholesterolemia	37 (9)	47 (11)	90 (19)	118 (26)	112 (24)	<0.001

Values are mean ± SD ;Values in parenthesis are percentages

risk factors, admission and discharge diagnoses, in-hospital mortality and number of in-hospital transfers to the catheterization laboratory.

Hypercholesterolemia was defined as known history of hypercholesterolemia on treatment or a fasting cholesterol > 5.5 mmol/l (212 mg/dl) within 24 hours of admission. Diabetes mellitus was defined as known history of diabetes on treatment or a fasting blood sugar of > 7.0 mmol/l (120 mg/dl) during the present hospital admission. Hypertension was labeled, if the patient had a known history of hypertension.

STATISTICAL ANALYSIS

The mean time between diagnostic ECG and administration of thrombolytic treatment was skewed. Non-parametric Kruskal-Wallis test was used to investigate the difference in the mean times throughout the five years. Chi-square test was used to examine the difference of the associations between the studied variables. Level of significance was considered at $p < 0.05$.

RESULTS

The clinical characteristics of patients are shown in Table 1. During the five years a total of 2,280 patients were admitted with AMI, out of whom 85% were male. The mean age of the patient population was 54.7 ± 11.7 years. Of note, is the high rate of smoking and diabetes among our AMI population (50% and 39% respectively). Hypertension was present in 32% of the patients. Significant increase in hypertension was noted over the years ($p = 0.02$). Hypercholesterolemia was found in 17.4% of the patients and showed an increasing trend over the study period ($p < 0.01$).

We studied our practice pattern over the five years in relation to the use of thrombolytic therapy; discharge medication; in-hospital transfer to catheterization laboratory and in-hospital mortality (Table 2). Out of the 2280 patients admitted with AMI, thrombolytic therapy was administered to 1394 (62%) patients. Among the 421 (38%) who did not receive thrombolysis, only 32 (7.6%) patients were missed, 213 patients (50% of non-thrombolysed group) were not fulfilling the ECG criteria for thrombolysis, 139 (33%) patients were late in presentation, 21 (5%) patients had contraindication and 16 (3.6%) were not thrombolysed for other reasons. There was a significant increase in the rate of thrombolysis throughout the five years ($p < 0.001$). The mean time between the first diagnostic ECG to thrombolytic therapy administration showed significant improvement over the last three years of the study period ($p < 0.001$).

Aspirin, beta-blockers, calcium channel antagonists, ACEI and lipid lowering drugs were given on discharge to 94%, 82%, 9%, 43% and 43% of the patients respectively. There was significant increase in the utilization of beta-blockers ($p < 0.0001$), ACEI ($p < 0.02$) and lipid lowering drugs ($p < 0.00001$).

We looked at the five year pattern in relation to in-hospital cardiac catheterization (Fig. 1). The number of in-hospital cardiac catheterization was 229 (10%). This number has significally increased over the five year study period ($p = 0.006$). The number of in-hospital deaths was 134 (6%) with no significant statistical difference over the studied years.

DISCUSION

Our AMI patients had a mean age of 54 ± 11.7 years, which is consistent with a young population structure in Kuwait. The prevalence of diabetes and smoking in our patients is relatively high. This reflects the high prevalence rates of these coronary risk factors in the community[13-15]. In the present study, we found a high rate of thrombolysis (62%), which increased significantly over the five years. It is of note, that this rate of lysis will become 95% when we exclude those MI patients who were not eligible for thrombolysis (*e.g.*, late presentation, non ST-segment elevation and contraindication). Therefore, the shortfall among the eligible population was low (5%). This is one of the highest reported rates of thrombolysis compared to the

Table 2: Changing pattern of different utilization therapies

	1998 N=424	1999 N=436	2000 N= 486	2001 N=462	2002 N=472	P-value
Discharge Medicine						
Aspirin	384 (91)	414 (96)	454 (94)	432 (94)	453 (96)	NS
Beta-blockers	324 (76)	342 (78)	391 (81)	406 (88)	416 (88)	<0.0001
Calcium Antagonist	31 (7)	33 (8)	53 (11)	42 (9)	44 (9)	NS
Angiotension converting enzyme inhibitors	171 (40)	179 (41)	195 (40)	225 (49)	213 (45)	=0.02
Lipid lowering	104 (25)	136 (31)	203 (42)	223 48)	309 (66)	0.0001
Thrombolytic Therapy	254 (60)	258 (59)	285 (59)	297 (64)	309 (66)	<0.001
Mean time between Diagnostic ECG to administration of thrombolysis (in minutes)	103.6	91.6	103.9	82	70.4	<0.001
Number of transfers to catheterization facility	30 (7)	39 (9)	44 (9)	49 (11)	67 (14)	0.006
Number of in-hospital deaths	29 (7)	27 (6)	36 (7)	26 (6)	16 (3)	NS

Values in parenthesis are percentages

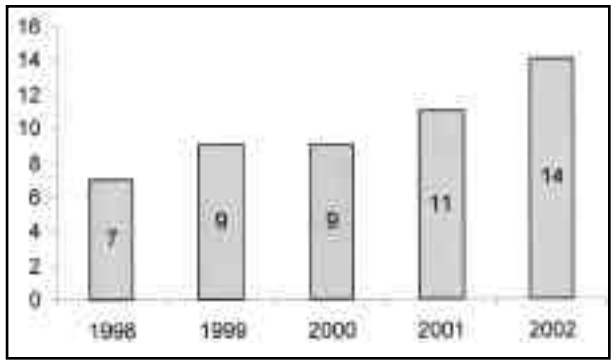

Fig. 1: Percentages of patients discharged to catheterization facility

shortfall which was about 30% in a recent European report[7]. Also, we found that the mean time from the first diagnostic ECG to the start of thrombolytic treatment was 90 minutes. This mean time was 104 minutes in 1998 and it shortened to 70 minutes in 2002. The overall mean time showed significant improvement over the study period. This shortening of the time to thrombolysis, has probably resulted from the change of policy from April 2002 of administering thrombolytic treatment in the Emergency Room. Prior to this date, thrombolytic therapy was being administered in CCU only. Several published guidelines recommend an optimal time of 30 minutes between hospital arrival and treatment[16,17]. Though our thrombolytic timing has improved, there remains a considerable in-hospital delay. We believe that the absence of emergency department triage protocols to be the major contributing factor to in-hospital delay in thrombolysis. This factor was previously shown to increase the time to treatment and should be addressed, so that maximum benefit from thrombolytic treatment is achieved[18,19].

The use of beta-blockers, ACEI, and lipid lowering drugs, which are therapies of proven benefit, improved significantly over the years. The highest increase in the utilization was shown in the use of lipid lowering drugs. These drugs were given to 25% of the patients in 1998 and to 66% in 2002. The increased use of these therapies is consistent with the recommendation from large randomized clinical trials that have shown the benefit of these drugs.

In our institution, we do not house catheterization laboratory and we do not follow the invasive strategy in the use of coronary angiography after the acute phase of AMI. Only patients who have evidence of persistent or recurrent ischemia are referred for angiography. The use of coronary angiography after AMI has been controversial, with some physicians advocating the routine invasive strategy to guide additional management, and others advocating the conservative, ischemic-guided strategy. These different clinical strategies have been compared in several recent clinical trials[20-23]. McClellan *et al* found substantial variation in use of coronary angiography after AMI in 205,021 patients in the United States, with no significant effect of invasive management on mortality after 1 to 4 years[24]. The TIMI-IIIB trial found no significant difference in death and non-fatal myocardial infarction after one year of follow up[20]. VAN-QWASH trial found significantly better survival in the first year of follow up among patients randomized to conservative therapy[21]. In contrast, FRISC-II3 and TACTICS-TIMI-18 have reported significantly lower rates of death and non myocardial infarction among patients randomized to an invasive therapy[22,23]. When we looked at the rate of in-hospital transfer to catheterization laboratory among our AMI patients, we found that this rate has doubled between 1998 and 2002. The increased rate of transfer in our study has several explanations. First, an interventional cardiologist became available at our institution and this provided easier access to the laboratory. Second,

clinicians are now more aware of the benefit of intervention.

Despite this significant change in the positive direction, the rate of in-hospital death did not change over the study period. It is possible that larger number of patients is needed to show the effect of these changing practices on mortality.

CONCLUSIONS

This study reflects the actual trend in AMI management in our institution over a five year period. Our study population is relatively young with high rates of smoking, diabetes and hypercholesterolemia. There was a clear trend for an increase in the utilization of proven beneficial therapy over this 5-year period.

REFERENCES

1. Health Kuwait, ed 32. Kuwait, Health and vital Statistics Division, Ministry of Health, 1995.
2. European Secondary Prevention Study Group: Translation of clinical trials into practice: A European population based study of the use of thrombolysis for acute myocardial infarction. Lancet 1996; 347:1203-1207.
3. Gottlieb SS, Mc Carter RJ, Vogel RA. Effect of beta-blockade on mortality in high-risk and low-risk patients after myocardial infarction. N Engl J Med 1998; 339:489-497.
4. Barron HV, Bowlby LJ, Breen T, Rogers WJ, Canto JG, Zhang Y, Tiefenbrunn AJ, Weaver WD. Use of reperfusion therapy for acute myocardial infarction in the United States: Data from the National Registry of Myocardial Infarction 2. Circulation 1998; 97:1150-1156.
5. Barron HV, Michaels AD, Maynard C, Every NR. Use of angiotensin-converting enzyme inhibitors at discharge in patients with acute myocardial infarction in the United States: Data from the National Registry of Myocardial Infarction 2. J Am Coll Cardiol 1998; 32:360-367.
6. Fonarow GC, French WJ, Parsons LS, Sun H, Malmgren JA. Use of lipid -lowering medications at discharge in patients with acute myocardial infarction in the United States: Data from the National Registry of Myocardial Infarction 3. Circulation 2001; 103:38-44.
7. Eagle KA, Goodman SG, Avezum A, Budaj A, Sullivan CM, Lopez-Sendon J, for the GRACE Investigators: Practice variation and missed opportunities for reperfusion in ST-segment elevation myocardial infarction; findings from The Global Registry of Acute Coronary Events (GRACE) 2002; 359:373-377.
8. Fibrinolytic therapy trialists' (FTT) collaborative group: indications for fibrinolytic therapy in suspected acute myocardial infraction: collaborative overview of early mortality and major morbidity results from all randomized trials of more than 1000 trials patients. Lancet 1994; 343:311-322.
9. Granger CB, Weaver WD. Reducing cardiac events after acute coronary syndromes. Rev Cardiovasc Med 2004; 5:S 39-46.
10. Galcera-Tomas J, Castillo-Soria FJ, Villegas-Garcia MM, *et al*. Effects of early use of atenolol or captopril on infarct size and ventricular volume: A double-blind comparison in patients with anterior acute myocardial infarction. Circulation 2001; 103:813-819.
11. ACE Inhibitor Myocardial Infarction Collaborative Group: Indications for ACE inhibitors in the early treatment of acute myocardial infarction: Systematic overview of individual data from 100.000 patients in the randomized trials. Circulation 1998; 97:2202-2212.
12. Ferrieres J, Cambou JP, Gueret P, Boultabi Y, Lablanche IM, Hanania G, Genes S, Cantet C, Danchin N. Effect of early initiation of statins on survival in patients with acute myocardial infarction (the USIC 2000 Registry). Am J Cardiol 2005; 95:486-489.
13. Rashed W, Zubaid M, David T, Mohammed B, Bashruthula MS, Smid J Khan H, Memon A. Patient characteristics and practice patterns in the treatment of acute myocardial infraction in Kuwait: a pilot study. Med Princ Pract 2002; 11:196-201.
14. Abdella N, Khogali M, Al -Ali S, Gumaa K, Bajaj J. Known type 2 diabetes mellitus among Kuwaiti population: A prevalence study. Acta Diabetol 1996; 33:145-149.
15. Taha TH, Moussa MA, Fenech FF. Diabetes mellitus in Kuwait: incidence in the first 29 years of life. Diabetologia 1983; 25:306-308.
16. Emergency Cardiac Care Committee and Subcommittee, American Heart Association: Guidelines for cardiopulmonary resuscitation and emergency cardiac care, 11: adult advanced cardiac life support. JAMA1992; 268:2199-2241.
17. National Heart Attack Alert Program Coordinating Committees, 60 Minutes to Treatment Working Group: Emergency Department: rapid identification and treatment of patients with acute myocardial infarction. Ann Emerg Med 1994; 23:311-329.
18. Sharkey SW, Burnette DD,Ruiz E, Hession WT, Wysham DG, Goldenberg IF, Hodges M.: An analysis of time delays preceding thrombolysis for acute myocardial infarction. JAMA. 1989; 262:3171-74.
19. Hirvonen TPJ, Halinen MO, Kala RA, Olkinuora JT for the Finish Hospitals' Thrombolysis Survey Group: Delays in thrombolytic therapy for acute myocardial infarction in Finland: results of national thrombolytic therapy delay study. Eur Heart J 1998; 19:885-892.
20. Anderson HV, Cannon CP, Stone PH, *et al.* One-year results of the thrombolysis in myocardial infarction (TIMI) IIIB clinical trial. J Am Coll Cardiol 1995; 26:1643-1650.
21. Boden WE, O'Rouke RA, Crawford MH, *et al*. Outcomes in patients with acute non-Q-wave myocardial infarction randomly assigned to an invasive as compared with a conservative management strategy. N Engl J Med 1998; 338:1785-1792.
22. Fragmin and Fast Revascularization during Instability in Coronary artery disease (FRISC II) Investigators. Invasive compared with non-invasive treatment in unstable coronary-artery disease: FRISC II prospective randomized multicentre study. Lancet 1999; 354:708-715.
23. Cannon CP, Weintraub WS, Domopoulos LA, *et al*. Comparison of early invasive and conservative strategies in patients with unstable angina and non-ST elevation myocardial infarction treated with the glycoprotein IIb / IIIa inhibitor triofiban. N Engl J Med 2001; 344:1879-1887.
24. McClellan M, McNeil BJ, Newhouse JP. Does more intensive treatment of acute myocardial infarction in the elderly reduce mortality? Analysis using instrumental variables. JAMA1994; 272:859-866.