

CLINICAL STUDY

Management and two-year prognosis of patients with acute myocardial infarction in a community hospital toward the end of thrombolytic era

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Abstract

Objectives: To analyze management, early and long-term prognoses of patients with ST-segment elevation myocardial infarction (STEMI).

Background: Until now, in Slovakia there have been no relevant data published on prognoses of patients who were treated due to STEMI one or more years ago. We also checked for the adherence to STEMI guidelines at a community hospital.

Patients and methods: All 112 patients admitted within 24 hours of STEMI to the Faculty Hospital in Bratislava-Petržalka in 2000–2001 were involved. Data on acute course of STEMI were acquired from medical records. Two years after STEMI patients were asked to complete a questionnaire. Standard statistic methods were used.

Results: Average age of patients was 59.9 ± 13.3 (mean \pm SD) years. Main prevalent risk factors included smoking (51.8 %), diabetes (22.3 %), hypercholesterolaemia (54.5 %), arterial hypertension (51.8 %). Thrombolytic treatment was given to 64.3 % of patients; other 25.0 % of patients were contraindicated because of their late presentation. Potentially serious complications occurred in 50.9 % of patients. Coronarography was performed during the hospitalization in 11.6 % of patients and within next 2 years in 19.2 % of patients. In-hospital mortality was 11.6 %, two-year mortality was 6.1 %.

Conclusion: High prevalence of risk factors, late presentation of patients together with low accessibility to early PCI were responsible for the high amount of patients with complicated STEMI course despite good adherence to clinical guidelines. We expect much better prognoses in patients treated with primary PCI since the management has changed in Slovakia. Long-term prognoses of patients discharged after uncomplicated STEMI and treated with early thrombolysis were optimistic (Tab. 5, Fig. 1, Ref. 17).

Key words: myocardial infarction, thrombolysis; prognosis, 2-year mortality.

Cardiovascular diseases are the leading cause of death worldwide. According to national statistic data, cardiovascular diseases are responsible for nearly half of the deaths in Slovakia (1). Acute coronary syndromes and particularly acute myocardial infarction (AMI) very often strikes seemingly healthy individuals. Its onset is sudden and it can dramatically change their future quality of life.

The prognosis of patients attacked by AMI can be significantly improved by modern therapy. The major roles in the management are played by early diagnosis of AMI, treatment of cardiac arrest, treatment of acute heart failure and early reperfusion therapy to limit the infarction size (2). Early reperfusion therapy,

treatment with aspirin, betablockers, ACE inhibitors, statins and other supportive treatment show clear benefit in many clinical studies (evidence-based medicine). Systematic evaluation of provided care and adherence to current guidelines based on actual knowledge and prepared by scientific associations should be implemented by all health-care providers.

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Tab. 1. Basic characteristics of the patients with STEMI.

	All patients n=112	Men n=81 72.3%	Women n=31 27.7%	p
Age (years)	59.9±13.3	56±11.6	69.9±12.3	<0.001
Family history of CVD	31 (27.7%)	22 (27.2%)	9 (29.0%)	NS
Smoking	58 (51.8%)	50 (61.7%)	8 (25.8%)	<0.01
Diabetes	25 (22.3%)	12 (14.8%)	13 (41.9%)	<0.01
Hypercholesterolaemia	61 (54.5%)	47 (58.0%)	14 (45.2%)	NS
Arterial hypertension	58 (51.8%)	39 (48.1%)	19 (61.3%)	NS
Obesity	42 (37.5%)	25 (30.9%)	17 (54.8%)	<0.05

p values from statistical tests of difference between men and women, CVD – cardiovascular diseases

In order to get in-depth information on the management and prognosis of patients with AMI in Slovakia a multicentric observational study of Audit of Cardiovascular Diseases (Audit) was conducted in years 1997 and 1998. Reperfusion thrombolytic therapy was administered to 45 % of patients with AMI with ST segments elevations (STEMI) in Slovakia (3). Mortality due to AMI reached 13.5 % (4).

Inspired by Audit, we conducted a retrospective analysis of the management, treatment and prognosis of patients with STEMI. We concentrated on patients' demographic characteristics, risk factors, early reperfusion and other provided treatment, in-hospital mortality and complications of AMI, as well as markers of high risk and number of invasive procedures. Moreover, the patients were checked up two years after AMI. Two-year mortality, patients' complaints and treatment were analyzed.

Patients and methods

All 112 patients admitted within the first 24 hours of STEMI to coronary care unit at the 4th Department of Internal Medicine at Faculty Hospital in Bratislava-Petržalka in 2000 and 2001 were involved into the study. Patients were identified retrospectively according to their discharge diagnosis. Electrocardiographic inclusion criteria were the same as actual ECG criteria for the initiation of thrombolytic therapy specified in the guidelines of management of AMI – ST segments elevations exceeding 1 mm in at least two contiguous leads or complete left bundle branch block not known to be old (5). Myocardial infarction had to be confirmed by biochemical markers – CK and CKMB on regular blood check-up. The test for more precise cardiospecific troponins was not routinely available at the hospital at that time.

Data on patient's demographic characteristic, clinical status on admission, treatment, AMI complications and outcomes were acquired from medical records. Two years after AMI we asked the patients to complete a questionnaire. Patients who did not answer were contacted by telephone. We received information on 90 patients (who represent 91 % out of all 99 discharged patients). All data were put into the computer database and analyzed anonymously.

Continuous data are given as mean±standard deviation or as median in not normal distribution and as frequencies for cate-

gorical variables. Differences in clinical characteristics between the subgroups were tested by t-test for continuous variables and by chi-square test for categorical variables. Multivariate logistic regression analysis was used to test a relationship between different predictor variables and dichotomous outcome variable. This relationship was later characterized as odds ratio (OR) with 95 % confidence interval (CI). Tests were performed in SPSS 10.0 for Windows (© SPSS Inc).

Results

Basic characteristics

Basic characteristics of the patients with STEMI in the study are shown in Table 1. Women with STEMI were significantly older than men. From the subgroup of women 24 (77.4 %) were over 65, whereas as many as 43 (53.1 %) of men were under 55. More than one single risk factor for AMI were identified in many patients. Among the smokers 65.5 % had hypercholesterolaemia ($p<0.05$), among the diabetics 56.0 % were obese ($p<0.05$). Smokers were significantly younger than non-smokers (53 ± 9 vs 67 ± 13 years, $p<0.001$) similarly as the patients with hypercholesterolaemia (58 ± 11 vs 63 ± 15 years, $p<0.05$), diabetics were older (68 ± 12 vs 58 ± 13 years, $p<0.001$). Hypercholesterolaemia was newly diagnosed at the time of STEMI in 72.1 % of cases.

Myocardial infarction was classified according to the localization of ST segment elevations as anterior in 45 (40.2 %) patients, inferior in 58 (51.8 %) patients and other AMI – “high” lateral or isolated posterior AMI in 9 (8.0 %) patients. We diagnosed right ventricular infarction in 14 (24.1 %) patients with inferior AMI. Inferior AMI was 2.2 times (95 % CI 1.1–4.8) more frequent in smokers than in non-smokers ($p<0.05$).

The average time delay from the beginning of AMI symptoms to the admission of patients was 8.5 ± 7.9 hours (median 5.0 hours). Within the first 2 hours 13.4 % and within the first 6 hours 57.1 % of patients were admitted.

Thrombolytic treatment

Thrombolytic treatment was given to 72 (64.3 %) patients (Tab. 2). Primary coronary intervention provided at the Slovak Institute of Cardiovascular Diseases in Bratislava was not routinely accessible for patients with AMI diagnosed at our hospital

Tab. 2. Thrombolytic treatment and early myocardial infarction complications.

	All patients n=112	Men n=81	Women n=31	p
Thrombolysis	72 (64.3)	58 (71.6%)	14 (45.2%)	<0.05
Hypotension	29 (25.9%)	19 (23.5%)	10 (32.3%)	NS
Shock	8 (7.1%)	3 (3.7%)	5 (16.1%)	<0.05
Pulmonary edema	16 (14.3%)	8 (9.9%)	8 (25.8%)	<0.05
Ventricular tachycardia/fibrillation	12 (10.7%)	9 (11.1%)	3 (9.7%)	NS
Bradycardia	17 (15.2%)	11 (13.6%)	6 (19.4%)	NS
Early angina pectoris	24 (21.4%)	16 (19.8%)	8 (25.8%)	NS
Reinfarction	3 (2.7%)	2 (2.5%)	1 (3.2%)	NS
Death	13 (11.6%)	7 (8.6%)	6 (19.4%)	NS

p values from statistical tests of difference between men and women

in 2000 and 2001. Late presentation (over 12 hours) was the main reason for not providing thrombolytic treatment in 70.0 % of cases (in 28 out of 40 patients not treated with thrombolysis). Other patients were not treated with thrombolysis because of cardiopulmonary resuscitation (2 patients), syncope with cranial injury (1 patient), transvenous external cardiostimulation (2 patients), nivelization of ST segment elevations before the treatment (1 patient), isolated true posterior AMI (2 patients) or not typical clinical/electrocardiographic AMI presentation (4 patients).

Thrombolysis was performed by use of streptokinase, which was our standard thrombolytic agent. Because of tight financial limitations we had an alteplase reserved for a patient, with clear contraindications to streptokinase (allergy etc). Successful reperfusion was supposed according to non-invasive criteria in 42 patients (58.3 % of patients treated with thrombolytic therapy). Diabetics had a lower probability of successful reperfusion by streptokinase (OR 5.7, $p < 0.05$). We observed some side effects of thrombolysis in 6 patients (8.3 % of patients treated), while none of them were considered as life threatening.

Complications of myocardial infarction

In-hospital STEMI complications are summarized in Table 2. Potentially life-threatening complications occurred in 57 patients (50.9 %). As many as 33 patients (29.5 %) suffered from shock, pulmonary edema or serious arrhythmias requiring defibrillation or a temporary pacemaker. Hypotension as the most common complication had to be treated with inotropic support in 75.9 % of cases. We did not find any relation between the occurrence of hypotension and thrombolytic treatment with strep-

Tab. 3. Basic characteristics of the patients with STEMI who died during the hospitalization or were successfully discharged.

	In-hospital death n=13	Discharged from hospital n=99	p
Age (years)	70.3±13.9	58.6±12.7	<0.05
Time delay (hours)	12.4±10.0	8.0±12.7	NS
Smoking	2 (15.4%)	56 (56.6%)	<0.01
Diabetes	7 (53.8%)	18 (18.2%)	<0.01
Hypercholesterolaemia	6 (46.2%)	55 (55.6%)	NS
Arterial hypertension	9 (69.2%)	49 (49.5%)	NS
Obesity	5 (38.5%)	37 (37.4%)	NS
Thrombosis	4 (30.8%)	68 (68.7%)	<0.05

p values from statistical tests of difference between those who died and those who were discharged

tokinase. Temporary pacemakers were placed in 5 patients (4.5 %). For early coronarography we transferred to the Slovak Institute for Cardiovascular Diseases in Bratislava 11 patients (45.8 %) from the subgroup of 24 patients with early unstable angina pectoris or later development of reinfarction. Early coronarography was performed also in 2 patients who were indicated due to their young age.

The comparison of characteristics of investigated patients with STEMI, who died during their hospitalization and those who were discharged, are shown in Table 3. The highest mortality was in the subgroups of patients with shock and pulmonary edema (Tab. 4). Heart failure deteriorated on the first day of hospitalization when compared with admission Killip Kimball class in 32 patients (28.6 %). Cardiogenic shock developed in 4 pa-

Tab. 4. Mortality due to STEMI according to Killip Kimball class.

Killip Kimball	Men n=81	Women n=31	In-hospital death	Death within 2 yrs after AMI
I	49 (60.5%)	8 (25.8%)	1 (1.8%)	4 (7.0%)
II	21 (25.9%)	10 (32.3%)	2 (6.5%)	2 (6.5%)
III	8 (9.9%)	8 (25.8%)	5 (31.3%)	7 (43.8%)
IV	3 (3.7%)	5 (16.1%)	5 (62.5%)	6 (75.0%)

tients and pulmonary edema in 11 patients without significant heart failure at the time of admission. After the exclusion of patients with cardiogenic shock, old age and diabetes were identified as the most significant predictors of adverse prognosis (OR for diabetes 6.9, 95 % CI 1.5–31.8, $p < 0.05$). Impacts of other selected risk factors on patients' prognoses are presented in Figure 1. Women in the study had the risk of death similar as men, when we accounted for associated risk factors.

Discharge after myocardial infarction

The average ejection fraction of left ventricle post STEMI assessed before the discharge of patients by routinely provided echocardiography was 49.4 ± 11.4 %. The ejection fraction was less than 30 % in only one patient, ejection fractions of 30–40 % were detected in 10 patients (10.6 %). The ejection fraction was better in the subgroup of patients treated with thrombolysis (52.1 ± 10.4 % vs 46.5 ± 10.95 %, $p < 0.05$). The exercise test was performed in 51 men (68.9 %) and 7 women (28.0 %). This test was positive in 20 men (39.2 %) and in only one woman (14.3 %).

Hospitalization due to STEMI lasted 15 ± 7 days on average. At the coronary care unit, patients stayed for the first 4 ± 4 days. There was no difference between men and women in their duration of hospitalization. Hospital stay was prolonged in patients with cardiogenic shock or pulmonary edema during the acute phase of STEMI as compared to patients with no or only moderate heart failure (13.9 ± 5.1 vs 18.5 ± 11.5 days, $p < 0.05$).

The treatment recommended at the discharge post STEMI is summarized in Table 5. The table is focused on the drugs showing benefit in secondary prevention of reinfarction and recommended in the guidelines.

Coronarography

Coronarography was performed later after the patients had been discharged in post STEMI state in 17 men (23.0 %) and 2 women (8.0 %). Coronarography was already planned at the time of discharge in 13 patients, additional 6 patients were indicated due to further deterioration of their cardiovascular status. Along with the latter 13 patients, who underwent early coronarography, this procedure was performed in the total of 32 out of 112 studied patients (28.6 %). Aortocoronary bypass graft surgery was performed in 7 patients due to the findings on coronary arteries.

Tab. 5. Treatment of the patients with STEMI at discharged and after 2 years.

	At discharge n=99	After 2 years n=84
Antithrombotic therapy	75 (75.8%)	64 (76.2%)
Anticoagulant therapy	24 (24.2%)	9 (10.7%)
Betablockers	72 (72.7%)	64 (76.2%)
ACE inhibitors	83 (83.8%)	47 (56.0%)
Statins	55 (55.6%)	36 (42.9%)

Antithrombotic therapy – acicidum acetylosalicilicum (or ticlopidin), anticoagulant therapy – warfarin, ACE – angiotensin converting enzyme

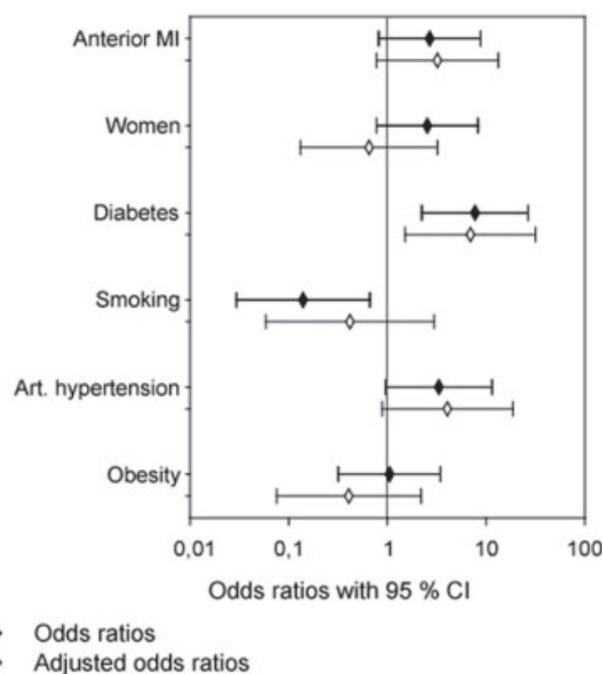


Fig. 1. Clinical characteristics and the risk of death in patients with STEMI.

Two years after myocardial infarction

Within the next two years, 6 out of 99 patients discharged after STEMI died, the fact of which represents mortality of 6.1 %. The death occurred in 3 men (4.1 %) and 3 women (12.0 %). All these patients were over 65 years; their early course of STEMI was complicated in 4 of them. None of them was treated with thrombolysis. New reinfarction was registered in further 5 patients (5.0 %).

At the time of the check-up 63 out of 84 patients (75 %), who filled in our questionnaire completely had no subjective complaints. Stable angina pectoris was presented in 9 patients (10.7 %), some degree of dyspnoe on exertion in 16 patients (19.0 %). The treatment at the time of control in these patients is given in Table 5.

Discussion

The district of Petržalka is a housing estate where most of our patients hospitalized due to a STEMI live. It was built 30 years ago and it is the largest housing estate in Bratislava. According to the population census data, about 120,000 people were living there, in 2001. Out of them 52.1 % were women, 75 % were in their productive period and 9 % were in their post-productive period, i.e. at senior age. At the hospital, no cardiac catheterization laboratory is available.

When compared with Audit, in our study there were higher proportions of men (72.3 % vs 64 %), active smokers (51.8 %

vs 27.2 %) and patients with hypercholesterolaemia (37.5 % vs 23.0 %) (3). Men in our study were nearly 5 years younger than those investigated within Audit (56.1 ± 11.6 vs 61.4 ± 12.0 years) (4). The early manifestation of AMI in our patients is attributable particularly to the high prevalence of the above-mentioned risk factors of atherosclerosis. In the world-wide perspective according to the multinational INTERHEART study, 35.7 % cases of AMI can be ascribed to smoking, 49.2 % to hypercholesterolaemia, 17.9 % to arterial hypertension and 9.9 % to diabetes (6). Most of our patients with STEMI had hypercholesterolaemia newly diagnosed at the time of AMI, the fact of which shows the existent limitations of population screening.

The thrombolytic treatment was given to nearly each of potential candidates in our study. Only 6 patients (5.4 %) were not subject to thrombolysis due to diagnostic problems with atypical clinical/electrocardiographic presentations of AMI (two of them with isolated posterior AMI). The thrombolytic treatment was quite safe and effective; neither in this study, nor in long-term analysis of the 1997–2000 period we recorded serious (unrecoverable) adverse events due to thrombolysis (7). We noticed an unacceptably long time-delay from AMI symptoms beginning to presenting in hospital, which in most cases actually resulted in thrombolysis contra-indication. The main factors responsible for late inclusion of patients into Audit were the expectations of spontaneous resolving of complaints and not recognizing the cardiac origin of complaints (8). Today it is generally recommended to activate the health-care system as soon as in 5 minutes after the beginning of chest pain.

Acute myocardial infarction is still a dramatic episode. During the course of AMI, almost one half of patients suffered a complication requiring rapid therapeutic reaction or special procedure. In-hospital mortality was still relatively high, but lower than in Audit (11.6 % vs 13.6 %) (4). According to Euro Heart Survey of Acute Coronary Syndromes in some developed European countries, the mortality due to AMI at a similar period was as low as 7 % (9). In the 1990–1999 period, the mortality due to AMI in United States gradually declined from 11.2 % down to 9.4 % (10).

The main factors, on the basis of which it was possible to predict an adverse early prognosis of AMI in our study include the advanced heart failure, old age, diabetes, anterior AMI and arterial hypertension. The latter factors are in accordance with large-study analyses (11, 12). Smokers had paradoxically better prognoses, the fact of which can be explained mostly by their young age (13).

In the view of current prospective we recognize the number of coronarographies performed in this study in acute setting and after STEMI as being low. The primary coronary intervention (PCI) is superior to thrombolysis in opening the occluded coronary artery, the fact of which has a clear impact on patients' prognoses. The mortality resulting from the meta-analysis of the conducted comparative studies reached 7 % in PCI group and 9 % in thrombolytic group ($p < 0.005$) (14). Primary coronary interventions are generally beneficial regardless of the inevitable delay due to transport of patients into the invasive center (15).

During the past years the management of patients with STEMI has changed also at our hospital. Most of eligible patients (STEMI and admission of patient up to 12 hours from the beginning of attack) are transferred for PCI directly from the central admission department. Actual logistic problems or high cost of PCI when compared with thrombolysis might potentially limit the 24-hour accessibility of PCI for all patients with STEMI in the future. In such a situation patients with unfavourable prognosis that can be predicted on the basis of identified high-risk factors should be preferred.

Until now, there have been published no relevant data on the prognosis of patients during one or two years after STEMI in Slovakia. Our study brings new data from the thrombolytic period. Prognoses of patients after their discharge after STEMI were generally good, mainly in the group of patients with uncomplicated AMI. Based on the analysis of patients' complaints, their quality of life has not been significantly reduced in most of them. In older GUSTO-I thrombolytic study, angina pectoris was observed in 20.6 % of patients and recurrent dyspnea in 27.5 % of patients 1 year after AMI (16). The resulting one-year mortality of 6.2 % was similar to the two-year mortality assessed in this study.

It is noticeable that 2 years after AMI, only less than half of the patients included into our study were treated with statin. Statin prescription at discharge was also less frequent than it is usual in the current practice since statin is being prescribed in nearly all patients suffering from STEMI. Our study is focused on the period before the clear benefit of early statin therapy was confirmed. Due to actual guidelines this treatment is generally recommended also in patients with average or virtually normal cholesterol level (17). The prescription of anti-thrombotic (or anticoagulant) treatment, beta-blockers and ACE inhibitors is acceptable at discharge as well as 2 years after AMI. The reasonable fall in ACE inhibitor treatment 2 years after AMI is justified in patients with no significant systolic dysfunction of left ventricle.

In conclusion, our study gives a view on the management of patients with STEMI from the community-wide prospective at the peak of the thrombolytic era in Slovakia. The high prevalence of coronary atherosclerosis modifiable risk factors, late presentation of patients with AMI symptoms at hospital together with low accessibility to early PCI at the time of study (years 2000–2001) were the main factors responsible for high amount of patients with complicated AMI course despite the very good adherence to guidelines at our hospital. In-hospital mortality in our study was comparable to that in other developed countries before PCI as the currently preferred and routinely performed early reperfusion method is gradually replacing the thrombolysis. Two-year mortality was low; the prognosis of our patients discharged after particularly uncomplicated STEMI and treated with early thrombolysis was optimistic with only a small impact of AMI on the quality of their life. The acute management of patients has changed rapidly also in Slovakia during the past years. We expect much better prognoses in patients with STEMI generally now treated with primary PCI.

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