

Management of myocardial infarction with ST-segment elevation in district hospitals without catheterisation laboratory – Acute Coronary Syndromes Registry of Małopolska 2002-2003

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Abstract

Introduction: Early reperfusion therapy significantly reduces mortality and improves outcome in ST-elevation myocardial infarction (STEMI). Primary percutaneous intervention has been proven to be a better therapeutic option than fibrinolysis when it can be performed by an experienced team of interventional cardiologists, within 90 minutes from the first medical contact. Despite the publication of guidelines of the European and American Scientific Societies (ESC and ACC/AHA), treatment of patients with STEMI is far from the optimum. The registry is an effective and reliable method to estimate the quality of treatment and demographic and epidemiologic characteristics of the population of a given region.

Aim: To evaluate the therapeutic strategies of treatment of STEMI in district hospitals without a catheterisation laboratory in Małopolska.

Methods: 29 district hospitals from Cracow and Małopolska province participated in the Registry of Acute Coronary Syndromes in Małopolska. Finally, 2382 patients with an initial diagnosis of acute coronary syndrome were included. In 867 of them, STEMI was finally diagnosed.

Results: In district hospitals, most patients with STEMI (63%) did not receive any reperfusion therapy (25% of them were >75 years old, in 20% chest pain lasted longer than 12 hours, in 7% cardiogenic shock was diagnosed and 12% had contraindications for thrombolysis or were at increased risk of haemorrhagic complications). Fifteen percent of all 867 patients were transferred to the interventional cardiology centre (63% for primary PCI, 20% for facilitated PCI and the remaining 17% for rescue PCI). Fibrinolysis was applied in 21% of all patients with STEMI. In-hospital mortality rate was 14.3% in patients treated with fibrinolysis as compared to 15.9% in those treated conservatively. Multivariate logistic regression revealed that younger age (OR 0.93; 95% CI 0.91–0.95; $p < 0.0001$), lack of diabetes (OR 0.54; 95% CI 0.30–0.98; $p = 0.04$) and higher systolic blood pressure (OR 0.93; 95% CI 1.00–1.02; $p = 0.006$) were independent factors predicting the referral of patients with STEMI for PCI. GP IIb/IIIa inhibitors were used in 5% of all patients and in 30% of those referred for PCI.

Conclusions: Only one in every 7 patients with STEMI is qualified for PCI. Patients transferred to the centre with PCI facilities are younger, have no diabetes or hypotension. The use of GP IIb/IIIa inhibitors is limited. There is a need to establish local networks of hospitals with 24-hour catheterisation laboratory availability to increase frequency and efficacy of reperfusion therapy, especially in regions far from centres of interventional cardiology.

Key words: acute myocardial infarction with ST-segment elevation, acute coronary syndrome, percutaneous coronary intervention, fibrinolysis, registry

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Introduction

Early coronary revascularisation is the preferred therapeutic option in patients with acute myocardial infarction with ST-segment elevation (STEMI). This is reflected in the current European and American guidelines for the treatment of STEMI [1, 2]. Effective reperfusion therapy is associated with significant reduction of mortality and improved outcomes. It has been demonstrated that primary percutaneous coronary intervention (PPCI), when compared to fibrinolysis, is a better therapeutic option if it can be performed by an experienced team of interventional cardiologists within 90 minutes of the first medical contact [3-6]. Metaanalysis of 23 randomised clinical trials has shown the advantage of intervention therapy over fibrinolysis [4].

Nevertheless, the evidence from randomised trials, which are often based on highly selected groups of patients, does not reveal the complexity of the problem because it does not address the whole group of patients with STEMI. The registry is an effective and reliable method to estimate quality of the treatment and demographic as well as epidemiologic characteristics of the population of a given region, which could be the basis for future, more precise randomised trials. Registries in STEMI are still useful and are being conducted on a large national and international scale [7-12]. The GRACE registry and Euro Heart Survey ACS have addressed the issues of implementation of guidelines into daily practice and have confirmed previously observed differences in therapeutic strategies between countries, regions and hospitals [7, 13-18].

Thus, the aim of this first registry in Małopolska province was the assessment of therapeutic pathways in STEMI in district hospitals without a catheterisation laboratory in Małopolska. Qualitative and quantitative characterisation of patients with acute coronary syndrome and STEMI in Małopolska province was another important aim.

Methods

Study group

In a database of the Acute Coronary Syndrome Registry of Małopolska information regarding patients with preliminary diagnosis of acute coronary syndrome (ACS) from district hospitals in Kraków (7 hospitals) and in the province of Małopolska (22 hospitals) from April 2002 to February 2003 was collected [8, 12]. The patients included in the present analysis had a confirmed diagnosis of STEMI based on clinical and biochemical data, according to the definition in the 2003 ESC Guidelines [2].

Demographics, clinical characteristics, biochemical parameters, and data on in-hospital follow-up and treatment have been presented for all patients with STEMI, either for those who were transferred to the interventional cardiology centre or those who were treated in a district hospital only. Presented data regarding in-hospital mortality refer to patients from district hospitals only.

Increased levels of troponin T (>0.1 ng/ml) or troponin I (above the upper limit of the local laboratory) and increased activity of MB fraction of creatine kinase – CK-MB (>6% of total activity of creatine kinase – CK) were accepted as reliable markers of myocardial injury.

Statistical analysis

Student's *t*-test was used for the analysis of continuous and χ^2 tests for parametric data. A *p* value <0.05 was considered statistically significant. For the selection of variables significantly associated with either in-hospital death in patients who remained in district hospitals or with transfer of the patient to the centre of interventional cardiology for coronary angiography and PCI, univariate analysis was used. Significant factors from univariate analysis were then included in the model of multivariate logistic regression analysis.

Results

Data on 2382 patients from the Registry of Acute Coronary Syndromes of Małopolska with initial diagnosis of ACS were collected; 867 of them were finally diagnosed as having STEMI.

Out of 554 patients, in whom STEMI was the final diagnosis, (64%) did not receive any effective reperfusion therapy. In 182 (21%) a fibrinolytic drug was given as the reperfusion method and 131 (15%) were transferred to the interventional centre for coronary angiography and PCI (Figure 1). There were significant baseline differences between these subgroups of patients: transferred to the catheterisation lab, treated with fibrinolysis in the district hospital and treated in the district hospital without any reperfusion therapy. Patients transferred for coronary angiography/PCI were younger, mostly men, and often had no history of ischaemic heart disease, congestive heart failure, diabetes or stroke (Table I). Multivariate logistic regression analysis revealed that younger age, lack of diabetes and higher systolic blood pressure were independent predictors of transfer of patient with STEMI for PCI (Table II).

In-hospital mortality in the whole group of patients treated in district hospitals only was 15.5%. In the fibrinolytic group in-hospital mortality was 14.3%

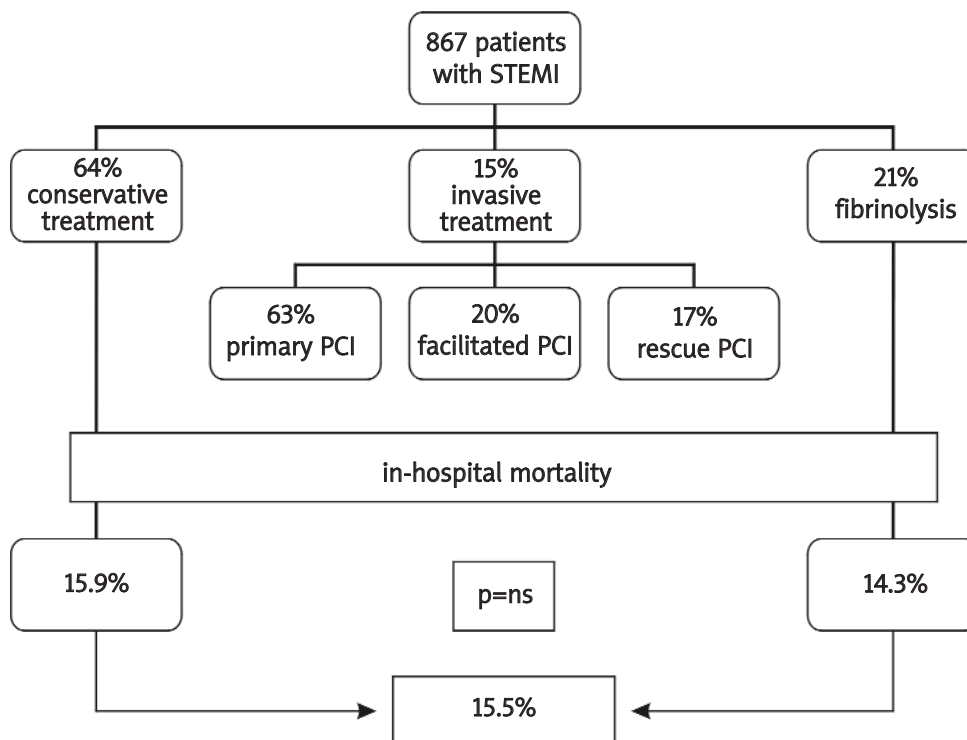


Figure 1. Type of the reperfusion therapy (or its absence) and in-hospital mortality in subgroups of patients with the final diagnosis of STEMI treated in district hospitals in Małopolska

Table I. Characteristics of patients with the final diagnosis of STEMI divided into three groups: transferred for angiography/PCI (“Invasive treatment”), treated with fibrinolysis in a district hospital (“Fibrinolysis”) and treated conservatively in a district hospital only (“Conservative treatment”)

	Invasive treatment	Fibrinolysis	Conservative treatment	p
% of STEMI patients	21%	15%	64%	
N	131	182	554	
Age (years)	59.6±10.9	67.7±10.9	70±11.1	<0.0001
Men	75.6%	66.5%	62.6%	0.02
BMI (kg/m ²)	27.1±4.3	26.8±5.4	26±4.1	NS
History of IHD	44.6%	53.8%	62.4%	0.006
History of MI	19.2%	22%	22.8%	NS
Heart failure	6.9%	15.9%	21.9%	0.001
History of PCI	3.1%	2.8%	1.6%	NS
History of CABG	0.8%	0%	1.1%	NS
History of stroke	2.3%	4.9%	8.5%	0.02
Diabetes	11.5%	20.9%	26.2%	0.01
Renal insufficiency	1.5%	2.2%	6.5%	NS
Hypertension	59.2%	61.5%	68.2%	NS
Smoking	45.4%	36.3%	26.2%	0.01
Dyslipidemia	32.3%	28.6%	29.1%	NS
Family history of IHD	28.5%	22.5%	21.3%	NS

BMI – body mass index, IHD – ischaemic heart disease, MI – myocardial infarction, PCI – percutaneous coronary angioplasty, CABG – coronary artery bypass graft. P values for all three groups

Table II. Results of multiple regression analysis characterising independent predictors of transfer of patients with STEMI for invasive treatment

	OR	95% CI	p
Age	0.93	0.91–0.95	<0.0001
Diabetes	0.54	0.3–0.98	0.04
Systolic blood pressure	1.01	1.00–1.02	0.006

OR – odds ratio, CI – confidence interval

Table III. Results of multiple regression analysis characterising independent predictors of in-hospital death in patients with STEMI treated in district hospitals only

	OR	95% CI	p
History of IHD	1.77	1.10–2.85	0.02
Systolic blood pressure	0.97	0.96–0.98	<0.0001
Heart rate	1.02	1.01–1.03	<0.0001

OR – odds ratio, CI – confidence interval, IHD – ischaemic heart disease

compared with a 15.9% in the group of conservative therapy (Figure 1). In multivariate analysis, independent risk factors of in-hospital death were: history of ischaemic heart disease (OR 1.77; 95% CI 1.10–2.85; $p=0.02$), lower systolic blood pressure (OR 0.97; 95% CI 0.96–0.98; $p<0.0001$) and higher heart rate (OR 1.02; 95% CI 1.01–1.03; $p<0.0001$) (Table III).

A group of 64% of patients with STEMI, who were not treated by reperfusion therapy (fibrinolysis and/or PCI), consisted of patients older than 75 years* (25%), in whom chest pain lasted longer than 12 hours (20%), who were in cardiogenic shock* (7%) and with contraindications for fibrinolysis or at increased risk of haemorrhagic complications (12%). In the remaining 36% no contraindications for reperfusion were found (PCI or fibrinolysis).

The GP IIb/IIIa receptor blockers were used in 5% of the whole group of patients and in 30% of those who were transferred for coronary angiography/PCI.

*Between 2002 and 2003 in the Małopolska province the programme of facilitated PCI was functioning, allowing the transfer of patients with STEMI from district hospitals to the Institute of Cardiology in Cracow, but patients with cardiogenic shock and older than 75 years were excluded because of contraindications for lytic therapy and transport.

Discussion

Comparing the therapeutic strategies used in hospitals without an on-site catheterisation laboratory in Małopolska and in Euro Heart Survey ACS, it is

evident that the use of β -blockers and GP IIb/IIIa receptor blockers was clearly lower than the European average (Figure 2). It should be added that the percentage of patients transferred to the invasive cardiology laboratory for coronary angiography (and PCI when needed) was very low, only 15% of patients compared to 56% in Europe. Taking into consideration that fibrinolysis was applied in 21% of patients in Małopolska, two of every three people suffering from STEMI did not receive any effective reperfusion therapy. The question arises why we do not follow the ESC guidelines which are endorsed also in Poland.

Interestingly, among patients treated conservatively without any reperfusion therapy there is a definite group with contraindications for PCI. However, 36% of all patients treated conservatively could undergo PCI. As a result, the rate of patients transferred for diagnostic angiography and reperfusion therapy would be similar to the European level. It is also worth emphasising that, based on the results of recent trials such as BRAVE 2, application of coronary angiography and PCI in patients presenting after 12 hours from onset of symptoms seems to be beneficial in terms of infarct size reduction, improvement of left ventricular ejection fraction and not significant reduction of death, recurrent myocardial infarction and stroke within 30 days of follow-up [19]. Special attention should be paid to elderly patients (above 75 years), with cardiogenic shock and ischaemic pain lasting for over 12 hours and with contraindications for thrombolysis. Development of treatment guidelines addressing these groups of patients would allow PCI to be used in an even larger group of patients suffering from STEMI. This is also the reason for the relatively high (almost 15%) mortality in patients treated conservatively in district hospitals. The real fact is that younger patients without diabetes or hypotension are transferred to the catheterisation laboratory. The others are high-risk patients.

In the Małopolska registry low molecular weight heparin (LMWH), despite the lack of guidelines addressing its issue, were used more often than in Europe. The question about the effectiveness of LMWH in STEMI was answered by the ExTRACT TIMI 25 study, which compared the effectiveness and safety of enoxaparin and unfractionated heparin with fibrinolytic therapy [20]. The higher effectiveness of LMWH in patients treated with fibrinolysis was associated with increased risk of haemorrhagic complications.

Another problem is the limited use of GP IIb/IIIa inhibitors in the Małopolska province. In the current 2003 guidelines for the treatment of STEMI, the use of abciximab as soon as possible is a IIa class

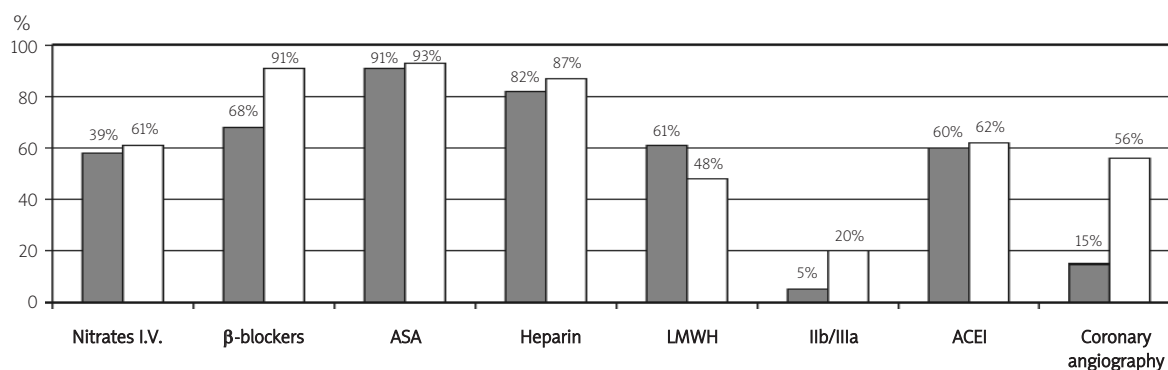


Figure 2. Comparison of the therapeutic strategies in STEMI in Małopolska (grey bars) and in Euro Heart Survey ACS (white bars)

ASA – acetylsalicylic acid, LMWH – low molecular weight heparin, ACEI – angiotensin converting enzyme inhibitors, IIb/IIIa – Glycoprotein IIb/IIIa receptor blockers

recommendation [2]. Similarly, in the European guidelines for PCI from 2005 the use of abciximab received class IIa recommendation [21]. Results from recent studies and metaanalyses have confirmed that patients with STEMI should receive abciximab as soon as possible, even before transfer to the catheterisation laboratory [22–24]. In this case the establishment of a network of hospitals cooperating with the invasive cardiology centre allows coordination of pre-hospital pharmacotherapy, which is of great importance in the context of the outcome and effectiveness of PCI in myocardial infarction.

In the Małopolska province between 2001 and 2003, the only possibility for pre-hospital administration of abciximab was the Facilitated Coronary Angioplasty Programme, where patients with STEMI who met the inclusion criteria received a half dose of alteplase and abciximab bolus [25, 26]. Since 2004 in the Małopolska region there is the ongoing randomised trial CARESS in AMI (Combined Abciximab REteplase Stent Study in Acute Myocardial Infarction) in which high-risk patients are treated with combination therapy: abciximab + + reteplase [27]. It seems that conservative treatment with streptokinase in this group of patients does not guarantee optimum treatment according to the ESC guidelines [2].

The idea of facilitated angioplasty means that all patients with STEMI would receive coronary angioplasty and PCI if necessary, regardless of the distance from the nearest catheterisation laboratory. Nonetheless, primary PCI should be available ultimately for the whole population of a region, meaning that new centres of invasive cardiology should be organised. Currently in Małopolska, within the structures of the Institute of Cardiology,

Jagiellonian University, there are catheterisation laboratories which cover a population of over 3.2 million people. The only possibility to perform primary PCI in all patients in the province within 90 minutes from the first medical contact is the establishment of new laboratories, with an experienced team, covering a population of 0.5 million each. These laboratories should be available twenty-four hours a day and should be placed over 90 minutes away from Cracow.

To increase the frequency and the efficacy of reperfusion therapy, local networks of hospitals cooperating with a 24-hour catheterisation laboratory should be built, especially in regions remote from the centres of invasive cardiology. Until now, facilitated angioplasty has been the only possibility for reperfusion therapy for patients from remote centres. It should be noted that this therapy was set only for patients younger than 75 years and without any contraindications for fibrinolytic therapy. Primary angioplasty is free from these limitations and may be applied in elderly patients (>75 years), even if they have contraindications for fibrinolysis. The analysis of the registry demonstrated that building networks of district hospitals cooperating with catheterisation laboratories with an experienced team in a reference centre is the optimum form of interventional care for the whole population of a given region. Good logistics and appropriate infrastructure are the formula for success. Intensive and continuous training addressed at hospitals from the network and close cooperation with the reference centre in terms of educational activities, scientific sessions, clinical rotations and the development of communication via the Internet seem to be also important.

The 2002-2003 Acute Coronary Syndromes Registry of Małopolska demonstrated that there is a need for collection and analysis of data of patients with acute coronary syndromes including STEMI. The Registry allows monitoring and modification of the treatment in cooperating centres. Additionally, we obtain data about the population of our region which could be helpful in planning future development of cardiology care in the province.

For data update and to observe changes during the last 2–3 years in Małopolska, a new edition of the Registry using internet-based forms is planned for 2005.

Conclusions

In the Małopolska province, despite the 24-hour availability of a catheterisation laboratory, only one of every seven patients with STEMI is referred for invasive treatment. Patients transferred to the invasive cardiology centre are younger, without diabetes mellitus or hypotension. The use of IIb/IIIa inhibitors is only occasional. To increase the frequency and efficacy of reperfusion therapy local networks of hospitals cooperating with the 24-hour catheterisation laboratory should be built, especially in regions remote from centres of invasive cardiology.

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Postępowanie w zawale mięśnia sercowego z uniesieniem odcinka ST w szpitalach rejonowych nieposiadających pracowni kardiologii inwazyjnej – Małopolski Rejestr Ostrych Zespołów Wieńcowych 2002–2003

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Streszczenie

Wstęp: Wczesna terapia reperfuzyjna pozwala istotnie zmniejszyć śmiertelność i poprawić rokowanie w zawale mięśnia sercowego z uniesieniem odcinka ST (STEMI). Pierwotna przeszskórna interwencja wieńcowa (PPCI) jest lepszą metodą leczenia od fibrylizacji, jeśli może być wykonana przez doświadczony zespół kardiologów interwencyjnych do 90 min od pierwszego kontaktu chorego z lekarzem. Pomimo publikacji wytycznych zarówno europejskich, jak i amerykańskich towarzystw naukowych (ESC i ACC/AHA), leczenie pacjentów ze STEMI wydaje się nadal dalekie od optymalnego. Skuteczną i wiarygodną metodą oceny jakości leczenia oraz charakterystyki demograficznej i epidemiologicznej chorych w danej populacji na danym terenie jest rejestr.

Cel: Celem utworzenia rejestru była ocena strategii terapeutycznych w leczeniu STEMI w szpitalach rejonowych w Małopolsce nieposiadających własnej pracowni hemodynamiki.

Metodyka: Małopolski Rejestr Ostrych Zespołów Wieńcowych w latach 2002–2003 obejmował 29 szpitali rejonowych z Krakowa i województwa małopolskiego. Do rejestru włączono ostatecznie 2382 pacjentów ze wstępny rozpoznaniem ostrego zespołu wieńcowego. U 867 z nich potwierdzono jako rozpoznanie ostateczne STEMI.

Wyniki: U większości pacjentów ze STEMI (63%) w szpitalach rejonowych nie zastosowano żadnej terapii reperfuzyjnej (25% chorych było w wieku powyżej 75 lat, u 20% ból wystąpił po ponad 12 godz., u 7% rozpoznano wstrząs kardiogeny, a jeśli chodzi o pozostałe 12% – albo stwierdzono u nich przeciwwskazania do fibrylizacji, albo potraktowano ich jako grupę o zwiększonym ryzyku powikłań krwotocznych). Do ośrodka kardiologii interwencyjnej przekazano 15% ze wszystkich 867 pacjentów – 63% jako PPCI, 20% jako torowaną PCI, a pozostałe 17% jako ratunkową PCI. Leczenie fibrynolityczne zastosowano u 21% wszystkich chorych ze STEMI. Śmiertelność wewnątrzszpitalna wśród pacjentów leczonych fibrylizacją wyniosła 14,3%, a leczonych zachowawczo 15,9%. Model regresji logistycznej analizy wieloczynnikowej wykazał, że niezależnymi czynnikami decydującymi o przestaniu pacjenta ze STEMI do leczenia inwazyjnego są: młodszy wiek (OR 0,93; 95% CI 0,91–0,95; p < 0,0001), brak cukrzycy (OR 0,54; 95% CI 0,30–0,98; p=0,04) oraz prawidłowe skurczowe ciśnienie krwi (OR 1,01; 95% CI 1,00–1,02; p=0,006). Blokery receptora GP IIb/IIIa podano 5% wszystkich pacjentów i 30% chorych przesyłanych do pracowni hemodynamiki.

Wnioski: Do leczenia inwazyjnego kierowany jest tylko co siódmy pacjent ze STEMI. Pacjenci przesyłani do ośrodka kardiologii inwazyjnej to chorzy młodszy, bez cukrzycy i bez hipotonii. Zastosowanie blokerów receptora GP IIb/IIIa jest rzadkie. W celu zwiększenia częstości oraz skuteczności leczenia reperfuzyjnego należy opracować w regionie lokalne sieci szpitali współpracujących z pracownią hemodynamiki dyżurującą 24 godz. na dobę, szczególnie na obszarach znacznie oddalonych od ośrodków kardiologii interwencyjnej.

Słowa kluczowe: zawał serca z uniesieniem odcinka ST, ostry zespół wieńcowy, przeszskórna interwencja wieńcowa, fibrylizacja, rejestr

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