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Primary percutaneous angioplasty, thrombolysis and conservative treatment in low-risk patients with ST-elevation myocardial infarction: effects on short- and long-term mortality

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Abstract

Background: Although primary coronary intervention (PCI) is currently regarded as the preferred reperfusion strategy in ST-elevation myocardial infarction (STEMI), its superiority over thrombolysis has been documented mainly in high-risk patients. In low-risk patients, the difference seems to be not so significant.

Aim: To evaluate the early and late mortality in low-risk STEMI patients treated with thrombolysis, PCI, or conservatively.

Methods: From a total of 3,780 consecutive STEMI patients presenting within 24 h from symptom onset, 990 low-risk patients (age < 70 years old, Killip-Kimball class 1 at admission, non-anterior STEMI) were selected. The median follow-up duration was 18.3 (14.2–25.0) months. The patients were subdivided into three groups: group A (n = 465) — treated with PCI; group B (n = 289) — treated with thrombolysis; and group C (n = 236) — treated conservatively.

Results: In the whole study group 12 (1.21%) patients died; 30-day mortality in group A was 0.65%. In group B five out of 289 (1.73%) patients died, and in group C four out of 236 (1.69%) patients died. No significant differences in 30-day mortality between these three groups were found (p = 0.3). During the long-term follow-up, 37 (3.7%) of 990 patients died. In group A 18 (3.9%) patients died, in group B ten (3.4%) patients died, and in group C nine (3.8%) patients died (p = 0.96).

Conclusions: No significant differences in 30-day or long-term mortality rates between conservative therapy, PCI or thrombolysis groups in low-risk STEMI patients were observed.

Key words: primary angioplasty, thrombolysis, acute myocardial infarction, prognosis

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INTRODUCTION

Although primary coronary intervention (PCI) is currently regarded as the preferred reperfusion strategy in ST-elevation myocardial infarction (STEMI), its superiority over thrombolysis has been documented mainly in high-risk patients [1]. In low-risk patients, the difference seems to be not so significant [2]. Similarly, the benefit of reperfusion therapy for STEMI is strongly dependent on the delay from symptom onset to treatment. However, time to treatment relation is well documented only for 'not low-risk' patients [2, 3]. There have been only a few studies comparing the results of thrombolysis and PCI in a 'low-risk' group [2, 4, 5].

In some trials, investigators have demonstrated a lack of cost-effectiveness for PCI in some cases, compared to thrombolytic treatment [6–8]. Moreover, to the best of our knowledge, no randomised comparative studies evaluating the usefulness of PCI and conservative therapy in the treatment of STEMI have been performed.

We aimed to evaluate the early and late mortality of low-risk patients with STEMI treated with thrombolysis, treated with PCI, or treated conservatively.

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METHODS

Study design

The detailed design and results of Wielkopolska Regional Registry of Myocardial Infarction (WIRE Registry) have been published previously [9]. In brief, in 2002 a regional treatment network of STEMI was developed and introduced in the Wielkopolska region of Poland. Data from 32 regional hospitals and from three catheterisation laboratories was obtained. All consecutive patients presenting within 24 h from symptom onset were included in the registry. The inclusion criteria were: (1) typical chest pain lasting > 30 min, (2) ST-segment elevation ≥ 0.1 mV or ≥ 0.2 mV in leads V_1–V_3 (at least two contiguous leads), and (3) elevated serum markers of myocardial necrosis: creatine kinase-MB isoenzyme or troponin concentrations. Clinical data were obtained from a survey specifically designed for the programme purposes. The data concerning hospitalisation covered the period from 1.01.2002 to 31.12.2002. The median follow-up time was 18.3 (14.2–25.0) months. General practitioners passed on the information to the cardiology departments. Data concerning deaths were verified in the Regional Statistical Office. All information was transferred to the coordinating centre, where statistical analysis was performed.

The study end-point was overall mortality. The study was performed according to the Declaration of Helsinki. The local Ethics Commitee approved the study protocol.

Study group

Of the total of 3,780 patients in our registry, 990 patients fulfilling the following criteria were selected: 1) age < 70 years old, 2) Killip-Kimball class 1 at admission, and 3) non-anterior STEMI. The patients were subsequently subdivided into three groups: group A (n = 465) — treated with PCI within 12 h from the onset of symptoms; group B (n = 289) — treated with thrombolysis within 12 h; and group C (n = 236) — conservative treatment — no reperfusion because of delay time or another reasons (suspected or real contraindications) (Fig. 1).

Statistical analysis

Continuous variables are presented as mean ± SD deviation. Measurements were compared by one-way analysis of variance and significant differences between the groups were sought by means of a Tukey multiple range test. Categorical variables are presented as a number (%) of observed events and the χ^2 analysis was used for comparisons of proportions. Each group of values was compared with all the other ones using Bonferroni correction for multiple comparisons. Kaplan-Meier curves were plotted to summarise the follow-up and compared using the log-rank test. Standard Cox proportional hazard regression model was performed to assess the relationship between potentially confounding variables (statistically significant in χ^2 test) and risk of overall mortality. Results of the analysis are presented in terms of the estimated hazard ratio with corresponding 95% confidence interval. A p value < 0.05 was considered statistically significant. All statistical measurements were made using StatSoft STATISTICA version 9.1 (data analysis software system).

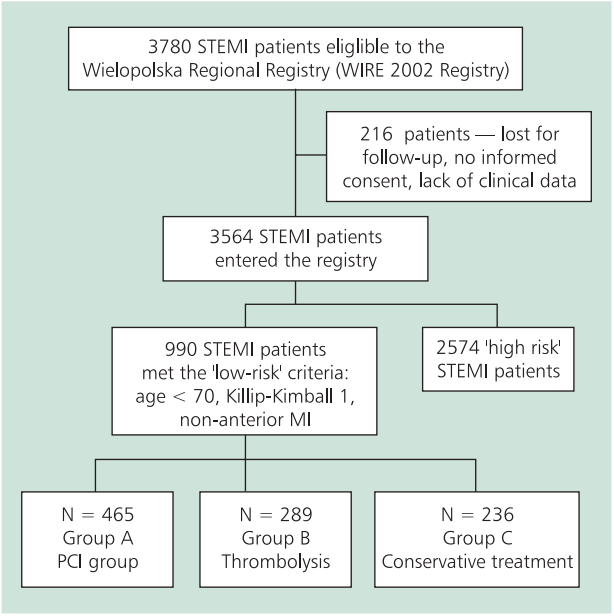

Figure 1. Study design; STEMI — ST segment elevation myocardial infarction; PCI — primary coronary intervention

RESULTS

General characteristics of study group are shown in Table 1.

30-day mortality

In the whole study group, (n = 990) 12 (1.21%) patients died; 30-day mortality in group A was 0.65% (three out of 465 patients). In group B, five of 289 (1.73%) patients died and in group C, four (1.69%) of 236 patients died. No significant differences in 30-day mortality between these three groups were found (p = 0.3). The Kaplan-Meier survival curves are shown in Figure 2.

Long-term mortality

The median follow-up time was 18.3 (14.2–22.0) months. In the long-term observation, 37 (3.7%) of 990 patients died. In group A, 18 (3.9%) patients died, in group B, ten (3.4%) patients died, and in group C, nine (3.8%) patients died; p = 0.96 (Fig. 3).

Multivariate analysis

In Cox proportional hazard regression model, none of the variables was significantly associated with mortality, both in uni- and multivariate analysis (Table 2).

DISCUSSION

In the present study, no significant differences in 30-day or long-term mortality rates between conservative therapy, primary angioplasty and thrombolysis in low-risk STEMI patients were observed. Overall mortality in all groups was very low: it did not reach 2% in 30 days or 4% in the long-term observation.

Table 1. Clinical characteristics of study groups

	Primary angioplasty Group A (n = 465)	Thrombolysis Group B (n = 289)	No reperfusion therapy Group C (n = 236)
Age [years]	56 ± 8.5	54 ± 8.5	57 ± 9.1
Male	333 (71.6%)	222 (76.8%)	177 (75%)
Hypertension#*	253 (54.4%)	105 (36.3%)	101 (42.7%)
Diabetes*	60 (12.9%)	48 (16.6%)	51 (21.6%)
Hypercholesterolaemia#*	275 (59.1%)	92 (31.8%)	74 (31.4%)
Smoking#†	180 (38.7%)	180 (62.3%)	114 (48.3%)
Previous history of:			
Myocardial infarction#*	81 (17.4%)	34 (11.7%)	20 (8.4%)
Primary coronary intervention#*	24 (5.2%)	6 (2.1%)	1 (0.4%)
Coronary artery bypass grafting	3 (0.6%)	1 (0.3%)	2 (0.8%)
Killip-Kimball class I	465 (100%)	289 (100%)	236 (100%)
Ejection fraction at discharge	49 ± 13.5	52 ± 9.5	51 ± 11
Creatinine kinase activity [U/L]	1426 ± 289	1328 ± 327	1389 ± 432
Medications at discharge:			
Aspirin	428 (92%)	263 (91%)	208 (88.1%)
Statins	394 (84.7%)	237 (82%)	186 (78.8%)
ACEI/ARB	386 (83%)	237 (82%)	189 (80.1%)
Beta-blockers	409 (88%)	244 (84.4%)	198 (83.9%)

#p < 0.05 for comparison between groups A and B; *p < 0.05 for comparison between groups A and C; †p < 0.05 for comparison between groups B and C; categorical variables were presented as a number (%) and continuous data are presented as a mean ± SD deviation; ACEI — angiotensin converting enzyme inhibitors; ARB — angiotensin receptor blockers

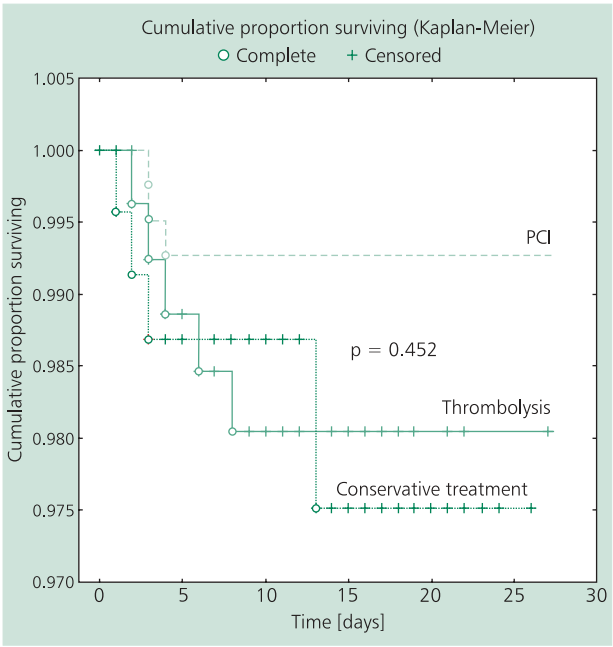

Figure 2. 30-day Kaplan-Meier surviving curves of study groups

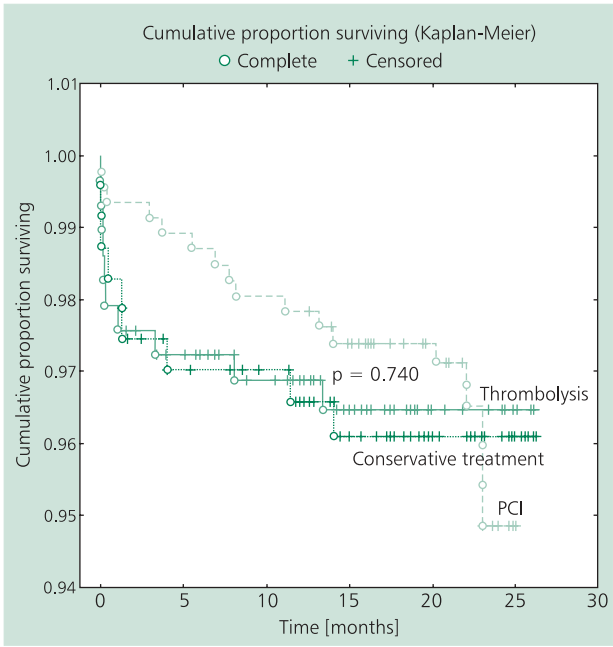

Figure 3. Long-term Kaplan-Meier surviving curves

The results of our study are consistent with the recent re-analysis of the DANAMI trial [4]. They compared PCI with thrombolytic therapy based on disease severity and found no significant differences between the groups in long-term mortality rate in low-risk STEMI patients. Our results are also in line with the recent data of Koyanagi et al. [8]. In this observational cohort study, the authors analysed the mortality in 1,437 patients treated with PCI or treated conservatively and

Table 2. Hazard ratio (HR) regarding 25-month mortality of patients who have undergone three therapeutic strategies

Explantantory variable	Predictors of overall mortality					
	Univariate model			Multivariate model		
	HR	95% CI	P	HR	95% CI	P
Primary percutaneous angioplasty	0.49	0.18–1.29	0.15	0.68	0.24–1.94	0.47
Thrombolysis	1.13	0.54–2.35	0.74	0.97	0.45–2.06	0.93
Conservative treatment	1.62	0.73–3.55	0.234	1.34	0.61–2.98	0.46
Diabetes	1.26	0.51–3.15	0.61	0.95	0.38–2.38	0.91
Hypertension	1.97	0.95–4.08	0.07	2.00	0.95–4.22	0.07
History of myocardial infarction	0.47	0.11–1.97	0.3	0.46	0.11–1.93	0.29
Hypercholesterolaemia	0.43	0.17–0.92	0.06	0.45	0.19–1.07	0.08
Smoking	0.49	0.23–1.05	0.07	0.54	0.24–1.19	0.13

CI — confidence interval

divided according to risk assessment. They concluded that although PCI is strongly correlated with low short- and long--term cardiac mortality rates in high-risk STEMI patients, no similar correlation was found in low-risk patients. Kent et al. [7] found that an effect on mortality from PCI was not likely in patients with estimated 30-day mortality rate of about 2% or less. The 30-day mortality rate in our low-risk group of patients treated with thrombolysis was 1.73% and only 1.69% in patients treated conservatively, so these rates correspond well to the group of patients not likely to obtain a reduction of mortality from PCI according to Kent et al. [7].

In addition, the recent analysis of Kent et al. [10] suggested that the mortality benefits of PCI and the hazard of PCI--related delay depend on baseline risk. Our findings underscore the results of other recent studies demonstrating that average summary results of clinical trials do not necessarily apply to all patients and the importance of using risk models to reveal clinically important patient variation in the likelihood of treatment benefit. The reason could be that low risk patients do not obtain a significant reduction of mortality and that this dilutes the benefit obtained by high-risk patients.

Limitations of the study

In the study, we used clinical criteria of low-risk evaluation such as age < 70 years, Killip-Kimball grade 1 on admission, and non-anterior MI. The established risk scores, such as TIMI risk score, GRACE, CADILLAC or PAMI used to evaluate the patients with STEMI, confirmed their predictive value [11]. We could not apply them because the risk scores were not available at the moment of programming the study. However, our criteria generally comply with the criteria that are the elements of the mentioned scores. The present study was an observational study, not a randomised controlled trial that randomly divided patients into study groups, and thus the results should be interpreted with caution.

CONCLUSIONS

Our observational study showed that there were no significant differences in 30-day or long-term mortality rates between conservative therapy, PCI, and thrombolysis groups in low-risk STEMI patients.

Conflict of interest: *none declared*

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Pierwotna angioplastyka wieńcowa, leczenie trombolityczne i zachowawcze u pacjentów niskiego ryzyka z zawałem serca z uniesieniem odcinka ST. Analiza śmiertelności krótko- i długoterminowej

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Streszczenie

Wstęp: Pierwotna angioplastyka wieńcowa (PCI) jest obecnie najskuteczniejszą metodą terapii ostrego zawału serca z uniesieniem odcinka ST (STEMI). Jej przewaga nad leczeniem trombolitycznym została jednak udokumentowana głównie u chorych wysokiego ryzyka. U pacjentów niskiego ryzyka różnice wydają się być nie tak znaczące.

Cel: Celem pracy była ocena wczesnej i późnej śmiertelności u chorych ze STEMI niskiego ryzyka leczonych trombolitycznie, pierwotną angioplastyką wieńcową lub zachowawczo.

Metody: Spośród kolejnych 3780 chorych ze STEMI hospitalizowanych w ciągu 24 godzin od wystąpienia objawów wybrano 990 pacjentów niskiego ryzyka (wiek < 70 lat, klasa Killipa-Kimballa 1 przy przyjęciu, zawał ściany innej niż przednia). Mediana czasu obserwacji wynosiła 18,3 miesiąca (14,2–25,0 miesięcy). Pacjentów podzielono na 3 grupy: grupa A (n = 465) — leczeni PCI, grupa B (n = 289) — leczeni trombolitycznie, grupa C (n = 236) — leczeni zachowawczo. Punktem końcowym był zgon z każdej przyczyny.

Wyniki: W całej badanej grupie zmarło 12 (1,21%) chorych; 30-dniowa śmiertelność w grupie A wynosiła 0,65%. W grupie B zmarło 5 (1,73%) spośród 289 pacjentów, a w grupie C — 4 (1,69%) z 236 pacjentów. Nie stwierdzono istotnych różnic w 30-dniowej śmiertelności między badanymi grupami; p = 0,3. W obserwacji długoterminowej zmarło łącznie 37 (3,7%) spośród 990 osób. W grupie A zmarło 18 (3,9%) pacjentów, w grupie B — 10 (3,4%), a w grupie C — 9 (3,8%) chorych; p = 0,96.

Wnioski: W badanej grupie osób ze STEMI niskiego ryzyka nie stwierdzono istotnych różnic w 30-dniowej i długoterminowej śmiertelności między chorymi leczonymi PCI, trombolitycznie i zachowawczo.

Słowa kluczowe: pierwotna angioplastyka, leczenie trombolityczne, ostry zawał serca, rokowanie

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