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In-Hospital Mortality and Treatment in Elderly Patients with ST-Elevation Myocardial Infarction

A. Sinkovič, Z. Pehnek

Abstract: Background: In STEMI early reperfusion therapy improves survival irrespective of age, though caution is recommended for iv. fibrinolysis in the elderly due to increased risk for brain haemorrhage. Primary percutaneous coronary intervention (PCI) improves survival in the elderly with STEMI most effectively, if performed without a delay – within 90 minutes from the first medical contact to balloon inflation. If primary PCI is inaccessible, iv. fibrinolysis in comparison to placebo significantly decreases mortality within first few hours of chest pain. Our aim was to compare retrospectively clinical characteristics and in-hospital mortality among consecutive STEMI patients ≥ 65 years treated either with primary PCI, or iv. fibrinolysis, or medically, and to evaluate the differences between elderly survivors and non-survivors. Methods: Out of 343 patients with STEMI 171 were ≥ 65 years, treated with iv. fibrinolysis, or primary PCI, or medical therapy. Results: 13.4 % of elderly with STEMI were treated with iv. fibrinolysis, 33.3 % with primary PCI and 42.6 % medically. Among the treatment groups we observed non-significant differences in in-hospital mortality (19.88 % vs. 15.8 % vs. 24.65 %, $p \geq 0.05$). Between elderly survivors and non-survivors we observed significant differences in peak

mean Troponin T (4.1 ± 5.2 vs. 6.6 ± 7.3 , $p < 0.05$), in presence of anterior infarction (40 % vs. 73.8 %, $p < 0.05$) and in admission cardiogenic shock (3.6 % vs. 64.7 %, $p < 0.05$), but non-significant differences in treatments. Conclusion: In-hospital mortality in the elderly with STEMI was significantly associated with an extensive anterior myocardial infarction with Q and cardiogenic shock on admission.

Kurzfassung: Spitalmortalität und Behandlung älterer Patienten mit ST-Hebungsinfarkt. Hintergrund: Beim ST-Hebungsinfarkt (STEMI) verbessert eine frühe Reperfusionstherapie das Überleben unabhängig vom Patientenalter, obwohl Vorsicht hinsichtlich der i.v.-Fibrinolyse bei älteren Patienten aufgrund eines erhöhten Risikos von Hirnblutungen angebracht ist. Die primäre perkutane Koronarintervention (PCI) erhöht die Überlebensrate von älteren Patienten mit STEMI am effektivsten, wenn sie ohne Zeitverzögerung innerhalb von 90 Minuten vom ersten Kontakt mit dem Patienten bis zur Balloninflation durchgeführt wird. Wenn eine primäre PCI nicht möglich ist, reduzierte die i.v.-Fibrinolyse verglichen mit Placebo die Mortalität signifikant innerhalb der ersten

Stunden nach Auftreten der Symptome. Unser Ziel war es, die klinischen Charakteristika sowie die Spitalmortalität konsekutiver STEMI-Patienten über 65 Jahre zu untersuchen, die entweder mit primärer PCI, i.v.-Fibrinolyse oder medikamentös behandelt wurden. Methodik: Von 343 Patienten mit STEMI waren 171 älter als 65 Jahre und wurden mit primärer PCI, i.v.-Fibrinolyse oder medikamentös behandelt. Ergebnisse: 13,4 % wurden mit i.v.-Fibrinolyse behandelt, 33,3 % mit primärer PCI und 42,6 % medikamentös. In der Behandlungsgruppe konnten wir nichtsignifikante Unterschiede in der Spitalmortalität beobachten (19,88 % vs. 15,8 % vs. 24,65 %, $p \geq 0,05$). Ältere Überlebende und Nichtüberlebende unterschieden sich signifikant hinsichtlich der Troponin-T-Spitzenwerte ($4,1 \pm 5,2$ vs. $6,6 \pm 7,3$, $p < 0,05$), im Vorhandensein einer anterioren Infarktlokalisation (40 % vs. 73,8 %, $p < 0,05$) und hinsichtlich des kardiogenen Schocks (3,6 % vs. 64,7 %, $p < 0,05$), jedoch nicht signifikant hinsichtlich der Behandlung. Schlussfolgerung: Die Spitalmortalität von älteren STEMI-Patienten war signifikant mit einer extensiven anterioren Infarktlokalisation mit Q-Zacken und kardiogenem Schock bei Einlieferung assoziiert. **J Kardiol 2005; 12: 282–4.**

■ Introduction

The incidence of STEMI and the risks for adverse outcome in the elderly with STEMI are increased in comparison to younger patients, but only few evidence exists for their optimal treatment, because majority of randomised clinical studies in the field of reperfusion therapy for STEMI systematically excluded patients > 75 years or underrepresented them with only about 10 % to 15 % [1–3]. In addition, registries demonstrated underutilisation of all types of reperfusion therapy in the elderly with STEMI due to atypical clinical presentation, frequent comorbidities and delayed presentation. Older age was an important predictor not to use reperfusion therapy – either iv. fibrinolysis or primary PCI [3–5]. Primary PCI improves survival in the elderly with STEMI most effectively, if performed without delay – within 90 minutes from the first medical contact to balloon inflation [6]. If primary PCI is inaccessible, then iv. fibrinolysis is its alternative when contraindications for its use are excluded [6]. Our aim was to compare retrospectively clinical characteristics and in-hospital mortality among consecutive STEMI patients ≥ 65 years treated either with primary PCI, or iv. fibrinolysis, or medically and to evaluate the differences between elderly survivors and non-survivors during in-hospital stay.

■ Patients and Methods

Out of 343 patients with STEMI, admitted to the Department of Medical Intensive Care in 2002 and 2003 we retrospectively analysed the clinical data of 171 patients ≥ 65 years. The inclusion criteria were chest pain at rest, lasting > 30 minutes and non-responding to sublingual nitroglycerin tablets

within the last 24–48 hours in addition to ST-segment elevation for at least 1–2 mm in at least two leads or in addition to presumably new bundle branch block in 12-lead ECG [6–8].

On admission to all the patients ECG was recorded, systemic iv. line was inserted and continuous electrocardiographic monitoring was started. Troponin T was estimated on admission and every 24 hours within the first days by immunochemical method (Boehringer Mannheim – Germany, normal levels up to 0.1 $\mu\text{g/L}$). 12-lead ECG was recorded every 24 hours during the first days, but in the case of reperfusion therapy, either primary PCI or iv. thrombolysis, also immediately after it was completed [6, 8].

All the patients were treated with acetylsalicylic acid (ASA) and unfractionated or low-molecular weight heparin. Reperfusion therapy with either primary PCI or iv. fibrinolysis was indicated, when ST-segment elevations or new bundle branch block on ECG were associated with chest pain lasting up to 12 hours. Primary PCI was preferred as reperfusion therapy, but when it was inaccessible and there were no contraindications, the patients were treated with iv. fibrinolysis – either with iv. streptokinase or alteplase. In addition, by the decision of the treating physician the patients were medicated also by nitroglycerin, clopidogrel, beta blockers, ACE inhibitors, statins, diuretics, calcium channel blockers, glycoprotein receptor blockers, dobutamine, noradrenaline, dopamin, intraaortic balloon counterpulsation, mechanical ventilation etc. [6–8].

Heart failure on admission was classified according to Killip and Kimball to classes I–IV. Patients in Killip class I were asymptomatic, in class II had S3 gallop and/or tachycardia, in Killip class III were in pulmonary oedema and in Killip class IV in cardiogenic shock [9].

During total in-hospital stay, combining the stay at the Department for Medical Intensive Care and the stay at medical

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wards, from where the patients were discharged home, we registered in-hospital mortality.

Our patients with STEMI, who were ≥ 65 years, were divided into three treatment groups: a group treated by iv. fibrinolysis, a group treated by primary PCI and a group treated by non-reperfusional medical therapy. The groups were compared regarding gender, Killip class on admission, time to treatment, peak mean Troponin T levels and in-hospital mortality. Finally, we compared non-survivors and survivors of in-hospital stay, regarding gender, prior MI, Killip class on admission, time to-treatment, peak mean Troponin T levels and different treatments.

Statistical analysis was performed by IBM PC, SPSS for Windows. The values were expressed as means $\pm$ standard deviations, or percentages where necessary. Differences among the groups were tested by the chi-squared test and two-sided Student's t-test. The p-value < 0.05 was statistically significant [10].

Results

Clinical characteristics of patients with STEMI ≥ 65 years are listed in Table 1. Comparisons of treatment groups, either with iv. fibrinolysis, or primary PCI, or medical non-reperfusional therapy are listed in Table 2. The only significant difference between patients treated with iv. fibrinolysis and primary PCI was in the development of anterior MI with Q, which was significantly more likely in patients treated with iv. fibrinolysis than with primary PCI. Between medically treated and patients with iv. fibrinolysis significant differences were only in duration of chest pain. Patients with iv. fibrinolysis were treated significantly earlier than medically treated. Between patients treated with primary PCI and medically treated we observed significant differences in gender, time to treatment and in the rate of Killip class I on admission. Patients treated with

primary PCI in comparison to medically treated patients were significantly more likely men than women, their chest pain lasted significantly more likely up to 6 hours and were significantly more likely in Killip class I on admission. A comparison of in-hospital survivors and non-survivors is listed in Table 3. We observed that in non-survivors the rate of anterior myocardial infarction with Q and of cardiogenic shock on admission was significantly increased in comparison to survivors. In addition mean peak Troponin T was significantly higher in non-survivors than survivors.

Table 2. Comparison of different treatment groups in patients ≥ 65 years with STEMI

Clinical characteristics	iv. fibrinolysis (n = 23)	Primary PCI (n = 57)	Medical Therapy (n = 73)
Men (%)	56	61.4*	39.7*
Previous MI (%)	21	28	29.4
Anterior Q MI (%)	52.2	40	53
Inferior Q MI (%)	43.5	49.1	32.9
Chest pain up to 3 hours (%)	47.8*	33.3*	12.3*
Chest pain 3–6 hours (%)	34.8*	31.5*	9.5*
Chest pain 6–12 hours (%)	8.6	10.5	16.4
Chest pain > 12 hours (%)	4.3*	19.3	53.4*
Admission Killip I (%)	39.1	59.6*	24.6*
Admission Killip II (%)	43.4	21	43.8
Admission Killip III (%)	4.3	7	12.3
Admission Killip IV (%)	13	12.3	19.2
Mortality (%)	19.9	15.8	24.7
Systemic bleedings (%)	8.6	7	6.8
Intracranial bleedings (%)	4.3	0	0
Transfusion therapy (%)	4.3	7	6.8
Mean admission Hb $\pm$ SD (g/L)	132.9 $\pm$ 12.7	128.9 $\pm$ 18.4	126.9 $\pm$ 21.3
Mean lowest in-hospital Hb $\pm$ SD (g/L)	119.1 $\pm$ 16.2	120.9 $\pm$ 20.2	116.9 $\pm$ 21.3
Mean highest in-hospital Hb $\pm$ SD (g/L)	133.9 $\pm$ 13.0	132.7 $\pm$ 16.2	132.9 $\pm$ 16.5

*p < 0.05 ; MI: myocardial infarction, Hb: haemoglobin

Table 1. Clinical characteristics of patients with STEMI ≥ 65 years

Clinical characteristics	All patients (n = 171)
Men (%)	48.5
Previous MI (%)	25.7
Anterior Q MI (%)	47.4
Inferior Q MI (%)	42.7
Non Q MI / AP (%)	5.3 / 4.7
Chest pain up to 3 hours (%)	29.8
Chest pain 3–6 hours (%)	19.3
Chest pain 6–12 hours (%)	11.1
Chest pain > 12 hours (%)	33.3
Admission Killip I (%)	42.7
Admission Killip II (%)	32.7
Admission Killip III (%)	8.8
Admission Killip IV (%)	15.8
Mortality (%)	19.9
iv. fibrinolysis (%)	13.4
Primary PCI (%)	33.3
Medical therapy (%)	42.7
Systemic bleedings (%)	6.4
Intracranial bleedings (%)	0.6
Transfusion therapy (%)	5.8
Mean admission Hb $\pm$ SD (g/L)	129.9 $\pm$ 18.9
Mean lowest in-hospital Hb $\pm$ SD (g/L)	118.6 $\pm$ 19.6
Mean highest in-hospital Hb $\pm$ SD (g/L)	133.2 $\pm$ 15.9

MI: myocardial infarction; PCI: percutaneous coronary intervention, Hb: haemoglobin

Table 3. Comparison of non-survivors and survivors with STEMI ≥ 65 years of age

Clinical characteristics	Non-survivors (n = 34)	Survivors (n = 137)	P
Men (%)	58.8	45.9	NS
Previous MI (%)	29.4	24.8	NS
Anterior Q MI (%)	73.8	40	< 0.05
Inferior Q MI (%)	26.5	87.7	< 0.05
Chest pain up to 3 hours (%)	26.4	30.6	NS
Chest pain 3–6 hours (%)	8.8	21.8	NS
Chest pain 6–12 hours (%)	14.7	10.2	NS
Chest pain > 12 hours (%)	41.2	31.3	NS
Admission Killip II (%)	20.6	35.8	< 0.05
Admission Killip III (%)	8.8	8.7	NS
Admission Killip IV (%)	64.7	3.6	< 0.05
iv. fibrinolysis (%)	14.7	13.1	NS
Primary PCI (%)	26.4	35	NS
Medical therapy (%)	52.9	40	NS
Peak mean Troponin T (μ g/L)	6.6 $\pm$ 7.3	4.1 $\pm$ 5.2	< 0.05
Peak Troponin T ≥ 1 μ g/L (%)	85.3	72.9	NS
Systemic bleedings (%)	20.6	2.9	0.001
Intracranial bleedings (%)	0	0.7	NS
Transfusion therapy (%)	11.8	4.4	NS
Mean admission Hb $\pm$ SD (g/L)	120.5 $\pm$ 22.9	131.2 $\pm$ 17.3	0.007
Mean lowest in-hospital Hb $\pm$ SD (g/L)	113.6 $\pm$ 22.6	119.8 $\pm$ 18.7	NS
Mean highest in-hospital Hb $\pm$ SD (g/L)	127.0 $\pm$ 18.9	134.8 $\pm$ 14.7	0.021

MI: myocardial infarction, PCI: percutaneous coronary intervention, Hb: haemoglobin

■ Discussion

We observed that with increasing age gender-related differences in the rate of STEMI are reduced, as our patients ≥ 65 years with STEMI were men in 48 % and women in 52 %. This observation is consistent with other studies, demonstrating that only in younger patients with STEMI men are in the majority in comparison to women [5]. Reperfusion therapy was used in 46 % of our elderly patients, that is similar as observed in the subanalysis of Euro Heart Survey [5]. Primary PCI was the leading reperfusion strategy in our elderly patients (33.3 % of all elderly with STEMI) and iv. fibrinolysis was given only in 13.4 % of all the elderly with STEMI. Regarding European registries we observed that we used primary PCI in elderly more and iv. fibrinolysis less likely [5]. However, non-reperfusional medical therapy was delivered to 42 % of patients, mostly due to late presentation > 12 hours from the start of chest pain. According to registries and studies reperfusion therapy in patients with STEMI in general – irrespective of age – is underused and older age was even a key factor not to use reperfusion therapy, either primary PCI or iv. fibrinolysis [1, 4, 5, 11].

In-hospital mortality of our elderly patients with STEMI was about 19 %. Comparing different treatment groups we observed that reperfusion therapy, especially with primary PCI was associated with the least mortality of about 15 %, but medical non-reperfusion therapy correlated with the highest in-hospital mortality of about 24.7 %, though the difference did not meet statistical significance.

In our elderly patients with STEMI extensive anterior myocardial infarction with Q-wave, as well as cardiogenic shock on admission were associated significantly with in-hospital mortality. The extent of ischaemic myocardial necrosis is the most important predictor of early and late morbidity as well as mortality after acute MI. Severe heart failure, including pulmonary oedema and cardiogenic shock, are among the most feared consequences of a large ischaemic necrosis, being the cause of early and late mortality [12]. Therefore, to prevent severe heart failure and improve survival early effective reperfusion treatment in STEMI patients, either with primary PCI or iv. fibrinolysis, is mandatory to achieve preservation of myocardium [5–7, 12].

Recent guidelines recommend early reperfusion therapy in patients with STEMI, either with primary PCI or iv. fibrinolysis irrespective of age. Regarding iv. fibrinolysis older age is not included among contraindications for its use, though caution is recommended in patients aged > 75 years due to increased risk for brain haemorrhage [6]. Regarding the Guidelines for PCI in 2005 primary PCI and iv. fibrinolysis are equally effective within the first three hours [7]. Primary PCI is the mostly preferred reperfusion therapy, especially in the elderly, because in comparison to iv. fibrinolysis it improves early and late survival, decreases the rate of reinfarction and haemorrhagic stroke [3, 13–15].

Iv. fibrinolysis in the first few hours of STEMI is the best alternative to primary PCI, if primary PCI is not accessible as it is the case in remote areas, where transport to interventional centers takes ≥ 90 minutes or if primary PCI is not accessible in interventional centers itself due to already occupied facilities,

because it improves survival in comparison to placebo [6, 7, 16]. According to the FFT trial the relative risk for bleeding is increased with older age, but reperfusion therapy in elderly saves more lives than in younger patients with STEMI when contraindications for iv. fibrinolysis are excluded [2]. Due to increased risk for intracranial haemorrhage, especially in the age ≥ 75 years novel iv. fibrinolytics such as tenecteplase are advised [17]. ASSENT-2 demonstrated that the use of iv. bolus of tenecteplase in comparison to iv. alteplase even in women > 75 years, weighing < 67 kg significantly decreased the incidence of cerebral bleeds, especially when combined with weight adjusted standard heparin [17–19].

Our conclusions are that elderly should be encouraged to seek medical help as early as possible when chest pain, characteristic of evolving acute myocardial infarction develops in order that reperfusion therapy can be initiated as soon as possible to prevent extensive ischaemic necrosis with the resulting severe heart failure, that is mostly associated with high mortality of elderly infarct patients.

References

1. Gurwitz JH, Col NH, Avorn J. The exclusion of the elderly and women from clinical trials in acute myocardial infarction. *JAMA* 1992; 268: 1417–22.
2. Fibrinolytic therapy Trialists' (FFT) Collaborative Group. Indications for fibrinolytic therapy in suspected acute myocardial infarction: collaborative overview of early mortality and major morbidity results from all randomized trials of more than 1000 patients. *Lancet* 1994; 343: 311–22.
3. Mehta RH, Rathore SS, Radford MJ, Wang Y, Wang Y, Krumholz HM. Acute myocardial infarction in the elderly: differences by age. *J Am Coll Cardiol* 2001; 38: 763–41.
4. Rathore SS, Mehta RH, Wang Y, Radford MJ, Krumholz HM. Effects of age on the quality of care provided to older patients with acute myocardial infarction. *Am J Med* 2003; 114: 307–15.
5. Rosengren A, Wallentin L, Gitt AK, Behar S, Battler A, Hasdai D. Sex, age, and clinical presentation of acute coronary syndromes. *Eur Heart J* 2004; 25: 663–70.
6. Van de Werf F, Ardissino D, Betriu A, Cokkinos DV, Falk E, Fox KAA, Julian D, Lengyel M, Neumann FJ, Ruzyllo W, Thygesen C, Underwood RS, Vahanian A, Verheugt FWA, Wijns W. Management of acute myocardial infarction in patients presenting with ST-segment elevation. *Eur Heart J* 2003; 24: 28–66.
7. Silber S, Albertsson P, Aviles FF, Camici PG, Colombo A, Hamm C, Jorgensen E, Marco J, Nordrehaug JE, Ruzyllo W, Urban P, Stone GW, Wijns W; Task Force Members. Guidelines for Percutaneous Coronary Interventions. The Task Force for Percutaneous Coronary Interventions of the European Society of Cardiology. *Eur Heart J* 2005; 8: 804–47.
8. Erhardt L, Herlitz J, Bossaert L, Halinen M, Keltai M, Koster R, Marcassa C, Quinn T, Van Weert H. Task force in the management of chest pain. *Eur Heart J* 2002; 23: 1153–76.
9. Killip T, Kimball JT. Treatment of myocardial infarction in a coronary care unit. A two years experience with 250 patients. *Am J Cardiol* 1967; 20: 457–64.
10. Jekel JF, Elmore JG, Katz DL (eds). Epidemiology, biostatistics and preventive medicine. 1st ed. W. B. Saunders Company, Philadelphia, 1996.
11. Hasdai D, Behar S, Wallentin L, Danchin N, Gitt AK, Boersma E, Fioretti PM, Simoons ML, Battler A. The Euro Heart Survey of Acute Coronary Syndromes. *Euro Heart Survey ACS. Eur Heart J* 2002; 23: 1190–201.
12. Schillinger M, Domanovits H, Paulis M, Nikfardjam M, Meron G, Kurkciyan I, Laggner AN. Clinical signs of pulmonary congestion predict outcome in patients with acute chest pain. *Wien Klin Wochenschr* 2002; 114: 917–22.
13. De Boer MJ, Ottervanger JP, Van't Hof WJ, Hoorntje JAC, Suryapranata H, Zijlstra F, on behalf of the Zwolle Myocardial Infarction Study Group. Reperfusion therapy in elderly patients with acute myocardial infarction. A randomized comparison of primary angioplasty and thrombolytic therapy. *J Am Coll Cardiol* 2002; 39: 1723–8.
14. Keely E, Boura JA, Grines CL. Primary angioplasty versus intravenous thrombolytic therapy for acute myocardial infarction: a quantitative review of 23 randomised trials. *Lancet* 2003; 361: 13–20.
15. Berger AK, Schulman KA, Gersh BJ, Pirsada S, Breall JA, Johnson AE, Every NR. Primary coronary angioplasty vs thrombolysis for the management of acute myocardial infarction in elderly patients. *JAMA* 1999; 281: 341–8.
16. Berger AK, Radford MJ, Wang Y. Thrombolytic therapy in older patients. *J Am Coll Cardiol* 2000; 36: 366–74.
17. Huber K. Increase of efficacy of thrombolytic therapy in acute myocardial infarction by improvement of the characteristics of new fibrinolytic agents. *Wien Klin Wochenschr* 2000; 112: 742–8.
18. Van de Werf F, Barron HV, Armstrong PW, Granger CB, Berlioli S, Barbash G, Pehrsson K, Verheugt FW, Meyer J, Betriu A, Califf RM, Li X, Fox NL; for the ASSENT-2 Investigators. Incidence and predictors of bleeding events after fibrinolytic therapy with fibrin-specific agents. A comparison of TNK-tPA and rt-PA. *Eur Heart J* 2001; 22: 2253–61.
19. Wallentin L, Goldstein P, Armstrong PW, Granger CB, Adgey AAJ, Arntz HR, Bogaerts K, Danays T, Lindahl B, Makijarvi M, Verheugt F, Van de Werf F. Efficacy and safety of tenecteplase in combination with the low-molecular-weight heparin enoxaparin or unfractionated heparin in the pre-hospital setting: the Assessment of the Safety and Efficacy of a New Thrombolytic Regimen (ASSENT)-3 PLUS randomized trial in acute myocardial infarction. *Circulation* 2003; 108: 135–42.

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