



Původní sdělení | Original research article

The magnitude of percutaneous coronary intervention treatment in high and medium risk non-ST elevation acute coronary syndrome

David Becker, Anna Móri, Gyorgy Bárczi, Hajnalka Vágó, Orsolya Szenczi, Balazs Berta, Krisztina Heltai, Endre Zima, Pal Maurovich-H., Bela Merkely

Semmelweis University Heart and Vascular Center, Budapest, Hungary

ARTICLE INFO

Article history:

Received: 27 February 2014

Received in revised form: 6 April 2014

Accepted: 8 April 2014

Available online: 9 May 2014

Klíčová slova:

Akutní koronární syndrom

GRACE

Perkutánní koronární intervence

SOUHRN

Úvod: Současné doporučené postupy Evropské kardiologické společnosti podporující invazivní léčbu akutního koronárního syndromu bez elevací úseku ST (non-STE AKS) jsou založeny na modelu stanovení rizika GRACE.

Cíl: Cílem této studie bylo zjistit, zda léčba non-STE AKS perkutánní koronární intervencí snižuje dlouhodobou mortalitu hodnocenou podle skóre rizika GRACE.

Metody: Provedli jsme retrospektivní studii se vzorkem po sobě jdoucích 680 pacientů s non-STE AKS léčených s použitím PCI v Kardiocentru Semmelweis University. Skóre rizika GRACE se vypočítávalo při příjmu každého pacienta. Byla stanovena průměrná hodnota relativního rizika v každé skupině a porovnána s dlouhodobým klinickým výsledkem léčby (sledována šestiměsíční mortalita).

Výsledky: Průměrná hodnota vypočítaného skóre GRACE byla 1,6 % u pacientů s nízkým rizikem, 5,0 % u nemocných se středně vysokým rizikem a 21,3 % u pacientů s vysokým rizikem. Naproti tomu dosáhlo zjištěné riziko úmrtí do šesti měsíců hodnoty 0,42 % u pacientů s nízkým rizikem, 1,1 % u nemocných se středně vysokým rizikem, a 12,6 % u vysoce rizikových pacientů. Rozdíl mezi vypočítanou a zjištěnou šestiměsíční mortalitou ve skupinách se středně vysokým a vysokým rizikem byl statisticky významný (střední riziko, $p = 0,004$; vysoké riziko, $p = 0,0097$). Skutečné riziko úmrtí u nemocných s nízkým rizikem bylo rovněž nižší – ne však statisticky významně – než vypočítané riziko.

Závěr: Riziko úmrtí pacientů s non-STE AKS léčených na pracovišti s vysokým počtem každoročně ošetřovaných této pacientské populace bylo statisticky významně nižší než riziko stanovené pomocí modelu rizika GRACE. Naše výsledky naznačují, že provádění perkutánní koronární intervence po non-STE AKS na základě rizika stanoveného pomocí modelu rizika GRACE je nejpřínosnější u nemocných se středně vysokým a vysokým rizikem.

© 2014, ČKS. Published by Elsevier Urban and Partner Sp. z o.o. All rights reserved.

ABSTRACT

Introduction: Current ESC guideline supported invasive treatment of non-ST elevation acute coronary syndrome (NSTEMI-ACS) is guided by GRACE risk model.

Objective: The aim of this study was to determine whether the percutaneous coronary intervention treatment in NSTEMI-ACS ameliorates the long-term mortality assessed by GRACE risk score.

Methods: We conducted a retrospective study of a consecutive sample of 680 patients with NSTEMI-ACS treated by PCI in Heart Center of Semmelweis University. The GRACE risk score was calculated for each patient at admission. The mean of relative risk in each group was assessed and compared with the long-term clinical outcomes (observed 6-month mortality).

Results: The mean of calculated GRACE amounts 1.6% for low risk patients, 5.0% for medium risk patients, and 21.3% for patients with high risk. In contrast, the observed risk of 6-month death was 0.42% for low risk patients, 1.1% for medium risk patients, and 12.6% for patients with high risk.

Difference between assessed and observed 6-month mortality in high risk and medium risk groups was significant (medium risk $p = 0.004$; high risk $p = 0.0097$). Observed risk of death in low risk patients was also lower, but not significant than assessed risk.

Conclusion: The risk of death in patients with NSTEMI treated in high volume center is significantly lower than predicted by GRACE risk model. Our results suggest that percutaneous coronary intervention treatment guided by GRACE risk model in medium and high risk patients with NSTEMI provides the greatest clinical benefit.

Keywords:

Acute coronary syndrome

GRACE

Percutaneous coronary intervention

Introduction

At least 70% of acute coronary patients are classified as those with either unstable angina or non-ST segment elevation myocardial infarction (NSTEMI) [1,2]. Despite secondary prevention including pharmacological treatment [3] and optimal cardiac rehabilitation [4] the long-term outcomes of patients with unstable angina or NSTEMI are equal or worse [5–9] than the outcomes in ST-segment elevation myocardial infarction [10]. These consequences are a result of increased age and further evidence of comorbidity such as diabetes mellitus, chronic kidney disease, previous myocardial infarction, coronary artery bypass graft surgery or advanced coronary disease. Consequently the risk stratification plays a key role in the management of NSTEMI [11–19]. The Global Registry of Acute Coronary Events (GRACE) risk model enables professionals to assess the risk of death and it also provides a guide to the invasive therapy [11,20–26].

The aim of the study was to determine whether the percutaneous coronary intervention treatment in NSTEMI-ACS could improve the long-term mortality according to the estimated GRACE risk score.

Methods

Study population

The study population included 690 consecutive patients with NSTEMI-ACS treated by PCI in the Heart Center of Semmelweis University Budapest, Hungary. Eligible patients were at least 18 years old and were admitted to the hospital with a pre-

sumptive NSTEMI-ACS which was verified. Each one of them was treated with percutaneous coronary intervention.

Patient stratification

The cohort of the present study ($n = 690$) was stratified on the basis of predefined cut-off points of the GRACE risk score into low, medium and high risk groups. The GRACE risk model is composed of the following predictor variables on presentation: age, heart rate, systolic blood pressure, cardiac arrest, Killip class, creatinine, ST segment deviation and biomarker status [27]. Points are scored according to set variables for each element, and the sum of the points equates to the GRACE risk score. All of the risk groups were divided into further subgroups by age: under 65 years, between 65 and 75 years, and above 75 years.

Statistics

Comparison of the predictor variables between the international GRACE patient population and the patients treated in the Semmelweis University Heart Center was made by χ^2 test. The mean of the individual GRACE risk scores was calculated in each risk group. χ^2 test was used for comparison of assessed and observed risk of death. All calculations were done with Excel 2009 (Microsoft Inc. Seattle, USA).

Results

Baseline clinical characteristics of 690 patients with NSTEMI-ACS treated with PCI in the Heart Center of Semmelweis

Table 1 – Baseline clinical characteristic of patients in Heart Center of Semmelweis University (HC-SE) and GRACE NSTEMI-ACS study (GRACE).

Patient characteristics	HC-SE ($n = 690$)	GRACE ($n = 23,825$)
Age (years)	67	67
Male (%)	69	65
Hypertension (%)	82*	64
Hypercholesterolemia (%)	48	51
Diabetes mellitus (%)	34*	27
Myocardial infarction (%)	51*	37
Percutaneous coronary intervention (%)	22	20
Coronary artery bypass graft (%)	12*	17

Values are n (%).

GRACE – Global Registry of Acute Coronary Events; HC-SE – Heart Center of Semmelweis University.

* $p < 0.05$.

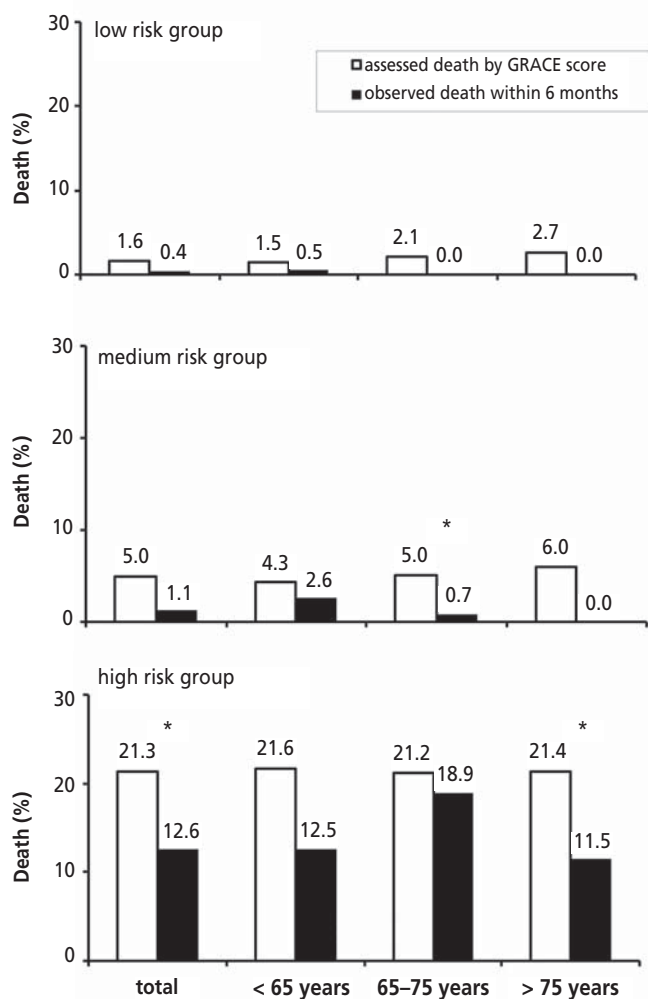


Fig. 1 – Assessed and observed 6-month mortality in low, medium and high risk groups. * Indicates statistically significant difference ($p < 0.05$).

University were compared to the characteristics of the population of GRACE NSTEMI-ACS registry in Table 1. Patients of our study population were more likely to have a history of hypertension, diabetes mellitus and previous myocardial infarction.

According to the calculated GRACE risk score, 184 patients were assigned to the group with high risk, 266 patients to the group with medium risk and 251 patients to the group with low risk. 27 patients died within 6 months after PCI, 22 of them showed high risk, 3 medium and only 1 patient was in the low risk group. The observed relative risk of 6-month mortality amounts to 12.6% for high risk patients, 1.1% for medium risk, and 0.4% for low risk.

The difference between assessed and observed 6-month mortality in high risk group was statistically significant ($p = 0.03$). Observed mortality in low and medium risk group was not significant but it shows a downward tendency. The patients between 65–75 years belonging to the medium risk subgroup and patients above 75 years belonging to the high risk subgroup had significantly lower observed mortality than assessed risk of death (Fig. 1.).

Discussion

The results of the present study show that the risk of death in patients with NSTEMI-ACS treated with PCI in a high volume center was significantly lower than predicted by the GRACE risk model. After PCI the observed mortality decreased in each risk group and subgroup compared to the assessed risk of death by GRACE score, significantly in patients with high risk (12.6% compared to 21.3%) and in patients between 65–75 years belonging to the medium subgroup (0.7% compared to 5.04%). The observed mortality in patients belonging to the medium risk group (1.1%) reached the level of the low risk group assessed by the GRACE risk model (1.6%). In point of mortality, patients in the medium risk group treated with PCI have fallen into the group with low risk. While our study population was more likely to have comorbidity (such as hypertension, diabetes mellitus or previous myocardial infarction) than the population studied in GRACE trial, after all the observed risk of death was lower.

Our results suggest that percutaneous coronary intervention treatment guided by expert cardiologists in a high volume interventional center provides the greatest clinical benefit in medium and high risk patients with NSTEMI-ACS assessed by GRACE risk model.

Conflict of interest

There is no known conflict of interest.

Funding body

There was no financial support for the conduct of the research and/or preparation of the article.

Ethical statement

This research was done according to the ethical standards.

Acknowledgements

Agnes Becker (data collection), Peter Vargha (statistics).

References

- [1] W. Rosamond, K. Flegal, K. Furie, et al., Heart disease and stroke statistics–2008 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee, *Circulation* 117 (2008) e25–e146.
- [2] C.W. Hamm, J.P. Bassand, S. Agewall, et al., ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: The Task Force for the management of acute coronary syndromes (ACS) in patients presenting without persistent ST-segment elevation of the European Society of Cardiology (ESC), *European Heart Journal* 32 (2011) 2999–3054.
- [3] A. Filippi, G. D'Ambrosio, S.E. Giustini, et al., Pharmacological treatment after acute myocardial infarction from 2001 to 2006: a survey in Italian primary care, *Journal of Cardiovascular Medicine* 10 (2009) 714–718.
- [4] F. Giallauria, R. Lucci, M. D'Agostino, et al., Two-year multicenter secondary prevention program: favorable effects on cardiovascular functional capacity and coronary risk profile after acute myocardial infarction, *Journal of Cardiovascular Medicine* 10 (2009) 772–780.
- [5] L.A. Allen, C.J. O'Donnell, C.A. Camargo Jr., et al., Comparison of long-term mortality across the spectrum of acute coronary syndromes, *American Heart Journal* 151 (2006) 1065–1071.
- [6] J.D. Abbott, H.N. Ahmed, H.A. Vlachos, et al., Comparison of outcome in patients with ST-elevation versus non-ST-elevation

- acute myocardial infarction treated with percutaneous coronary intervention (from the National Heart, Lung, and Blood Institute Dynamic Registry), *American Journal of Cardiology* 100 (2007) 190–195.
- [7] O.M. Jolobe, Guidelines for the diagnosis and treatment of non-ST segment elevation acute coronary syndromes, *European Heart Journal* 29 (2008) 277.
- [8] G. Montalescot, J. Dallongeville, E. Van Belle, et al., STEMI and NSTEMI: are they so different? 1 Year outcomes in acute myocardial infarction as defined by the ESC/ACC definition (the OPERA registry), *European Heart Journal* 28 (2007) 1409–1417.
- [9] K.A. Fox, K.F. Carruthers, D.R. Dunbar, et al., Underestimated and under-recognized: the late consequences of acute coronary syndrome (GRACE UK-Belgian Study), *European Heart Journal* 31 (2010) 2755–2764.
- [10] P. Tousek, F. Tousek, D. Horak, et al., The incidence and outcomes of acute coronary syndromes in a central European country: results of the CZECH-2 registry, *International Journal of Cardiology* 173 (2014) 204–208.
- [11] K.A. Fox, O.H. Dabbous, R.J. Goldberg, et al., Prediction of risk of death and myocardial infarction in the six months after presentation with acute coronary syndrome: prospective multinational observational study (GRACE), *British Medical Journal* 333 (2006) 1091.
- [12] J. Kowalczyk, R. Lenarczyk, K. Strojek, et al., Prognosis in diabetic patients with acute myocardial infarction treated invasively is related to renal function, *Medical Science Monitor: International Medical Journal of Experimental and Clinical Research* 16 (2010) CR67–CR74.
- [13] P. Perrone-Filardi, L. Pace, S. Dellegrottaglie, et al., Rest-redistribution 201-Thallium single photon emission computed tomography predicts myocardial infarction and cardiac death in patients with ischemic left ventricular dysfunction, *Journal of Cardiovascular Medicine* 10 (2009) 122–128.
- [14] K.E. Hammermeister, T.A. DeRouen, H.T. Dodge, Variables predictive of survival in patients with coronary disease. Selection by univariate and multivariate analyses from the clinical, electrocardiographic, exercise, arteriographic, and quantitative angiographic evaluations, *Circulation* 59 (1979) 421–430.
- [15] D. Hasdai, S. Behar, V. Boyko, et al., Cardiac biomarkers and acute coronary syndromes—the Euro Heart Survey of Acute Coronary Syndromes Experience, *European Heart Journal* 24 (2003) 1189–1194.
- [16] D. Hasdai, A. Porter, A. Rosengren, et al., Effect of gender on outcomes of acute coronary syndromes, *American Journal of Cardiology* 91 (1466–1469) (2003) A1466.
- [17] O. Manfrini, R. Bugiardini, Barriers to clinical risk scores adoption, *European Heart Journal* 28 (2007) 1045–1046.
- [18] R. Spacek, P. Widimsky, Z. Straka, et al., Value of first day angiography/angioplasty in evolving Non-ST segment elevation myocardial infarction: an open multicenter randomized trial. The VINO Study, *European Heart Journal* 23 (2002) 230–238.
- [19] P. Widimsky, W. Wijns, Z. Kaifoszova, Stent for Life: how this initiative began?, *EuroIntervention* 8 (Suppl. P) (2012) P8–P10.
- [20] A. Alonso, J.M. Gore, H.H. Awad, et al., Management and outcomes of patients presenting with STEMI by use of chronic oral anticoagulation: results from the GRACE registry, *European Heart Journal. Acute Cardiovascular Care* 2 (2013) 280–291.
- [21] K.A. Fox, S.G. Goodman, F.A. Anderson Jr., et al., From guidelines to clinical practice: the impact of hospital and geographical characteristics on temporal trends in the management of acute coronary syndromes. The Global Registry of Acute Coronary Events (GRACE), *European Heart Journal* 24 (2003) 1414–1424.
- [22] R.J. Goldberg, P.G. Steg, I. Sadiq, et al., Extent of, and factors associated with, delay to hospital presentation in patients with acute coronary disease (the GRACE registry), *American Journal of Cardiology* 89 (2002) 791–796.
- [23] S.G. Goodman, P.G. Steg, K.A. Eagle, et al., The diagnostic and prognostic impact of the redefinition of acute myocardial infarction: lessons from the Global Registry of Acute Coronary Events (GRACE), *American Heart Journal* 151 (2006) 654–660.
- [24] C.B. Granger, Strategies of patient care in acute coronary syndromes: rationale for the Global Registry of Acute Coronary Events (GRACE) registry, *American Journal of Cardiology* 86 (2000) 4M–9M.
- [25] A.T. Yan, R.T. Yan, M. Tan, et al., In-hospital revascularization and one-year outcome of acute coronary syndrome patients stratified by the GRACE risk score, *American Journal of Cardiology* 96 (2005) 913–916.
- [26] R.S. Wright, J.L. Anderson, C.D. Adams, et al., 2011 ACCF/AHA focused update of the Guidelines for the Management of Patients with Unstable Angina/Non-ST-Elevation Myocardial Infarction (updating the 2007 guideline): a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines developed in collaboration with the American College of Emergency Physicians, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons, *Journal of the American College of Cardiology* 57 (2011) 1920–1959.
- [27] A.T. Yan, R.T. Yan, M. Tan, et al., Risk scores for risk stratification in acute coronary syndromes: useful but simpler is not necessarily better, *European Heart Journal* 28 (2007) 1072–1078.