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Original Article

Comparison of long-term mortality of acute ST-segment elevation myocardial infarction and non-ST-segment elevation acute coronary syndrome patients after percutaneous coronary intervention

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Abstract: Background and aims: This study is to compare the short-term and long-term mortality in patients with ST-segment elevation myocardial infarction (STEMI) and non-ST-segment elevation acute coronary syndrome (NSTE-ACS) after percutaneous coronary intervention (PCI). Methods and results: A total of 266 STEMI patients and 140 NSTE-ACS patients received PCI. Patients were followed up by telephone or at medical record or case statistics center and were followed up for 4 years. Descriptive statistics and multivariate survival analyses were employed to compare the mortality in STEMI and NSTE-ACS. All statistical analyses were performed by SPSS19.0 software package. NSTE-ACS patients had significantly higher clinical and angiographic risk profiles at baseline. During the 4-year follow-up, all-cause mortality in STEMI was significantly higher than that in NSTE-ACS after coronary stent placement (HR 1.496, 95% CI 1.019-2.197). In a landmark analysis no difference was seen in all-cause mortality for both STEMI and NSTE-ACS between 6 month and 4 years of follow-up (HR 1.173, 95% CI 0.758-1.813). Conclusions: Patients with STEMI have a worse long-term prognosis compared to patients with NSTE-ACS after PCI, due to higher short-term mortality. However, NSTE-ACS patients have a worse long-term survival after 6 months.

Keywords: Coronary stent placement, long-term prognosis, long-term survival, mortality

Introduction

Coronary intervention technology benefited patients with coronary heart disease significantly. In the non-reperfusion therapy era, early studies found that the mortality rate of acute Q-wave myocardial infarction was 30%, while non Q-wave myocardial infarction was 45% [1]. In the present era, the interventional techniques have developed rapidly. Primary percutaneous coronary intervention (PCI) for patients with acute ST-segment elevation myocardial infarction (STEMI) and non-ST segment elevation acute coronary syndrome (NSTE-ACS) after early invasive therapy can have similar survival benefit [2], significantly decreasing hospital mortality of acute coronary syndrome. Although most studies have reported higher hospital case-fatality rates among STEMI patients [3], but results of the Global Registry of Acute Coronary Events (GRACE) revealed lower postdischarge mortality in STEMI versus NSTEMI patients [4]. OPERA and GRACE [5, 6] registry studies reported that in-hospital mortality of STEMI patients was 7.8% and 4.6% and that of NSTE-ACS was 5.9% and 4.3%, respectively. For STEMI patients, primary PCI saves more endangered necrotic myocardium and improves patient survival earlier compared to thrombolysis drugs. With the development of drug-eluting stents, long-term survival without adverse cardiac events has been improved significantly. Instead of positive anticoagulation therapy, more and more patients with NSTE-ACS prefer early intervention therapy. In this study, we compared the short- and long-term survival between STEMI and NSTE-ACS patients after PCI.

Materials and methods

Patients

Between April 2009 and December 2013, 266 STEMI and 140 NSTE-ACS patients were select-

Table 1. Baseline data for the two groups of patients

		STEMI (n = 266)	NSTE-ACS (n = 140)	P*
Age		61.48 ± 12.08	67.74 ± 11.77	P < 0.001
Serum creatinine (μmol/L)		103.54 ± 35.41	110.96 ± 28.26	0.033
LVEF		54.09 ± 8.74	53.74 ± 10.85	0.75
Sex (male)		220 (82.7%)	104 (74.3%)	0.045
Cardiovascular risk factors	Type 2 Diabetes mellitus	66 (24.8%)	52 (37.1%)	0.009
	Hypertension	158 (59.4%)	110 (78.6%)	P < 0.001
	Hypercholesterolemia	134 (50.4%)	112 (80.0%)	P < 0.001
Multivessel disease		112 (42.1%)	92 (65.7%)	P < 0.001

Note: *, P < 0.05 are considered statistically significant.

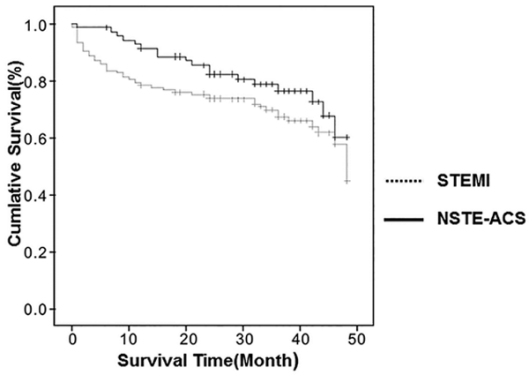

Figure 1. Cumulative survival rate in 0-48 months determined by Kaplan-Meier method (Log Rank P = 0.037).

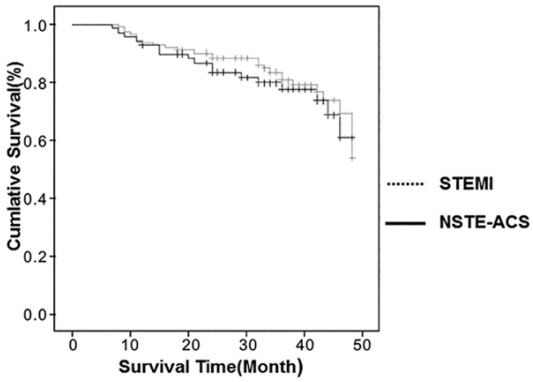

Figure 2. Cumulative survival rate in 6-48 months determined by Kaplan-Meier method (Log Rank P = 0.469).

ed for immediate primary PCI, except for the line of rescue PCI for failed thrombolysis patients. The STEMI diagnostic criteria were an ST segment elevation of ≥ 2 mm in adjacent chest leads and/or an ST segment elevation of > 1 mm in two or more standard leads or a new left bundle branch block and positive cardiac markers. NSTEMI was diagnosed in the absence of ST segment elevation and positive cardiac necrosis markers.

All the subjects were patients of Beijing Shijitan Hospital, Capital Medical University. This study was approved by Ethics Committee of Capital Medical University and the informed consent forms were signed by all the subjects.

PCI was performed according to standard procedures. All the patients were given 300 mg aspirin and 300 mg clopidogrel before PCI, and 1000 IU/kg heparin during surgery. Administering of GPIIb-IIIa receptor antagonist followed the surgeon's instruction, and the drug-eluting stent was implanted according to PCI guidelines. Patients were given dual antiplatelet therapy in less than 12 months after surgery. Other drugs such as statins and angiotensin-converting-enzyme inhibitors were administered according to the patients' clinical conditions. Patients were followed up by telephone or at medical record or case statistics center.

Statistical analyses

Continuous variables were expressed as means ± SD, and the two groups were compared by independent samples T-test. Categorical variables were described by percentages, and the two groups were compared by Pearson chi-square test. Kaplan-Meier method was used to describe cumulative survival rates and Log rank test was used to evaluate the difference. COX proportional hazards regression model was used to value the survival of two groups with multivariate analysis, and the short and long-term mortality risk ratio was described by the landmark 6 months after surgery. All statistical analyses were performed by SPSS19.0 software package.

Results

Baseline statistics of the patients

Baseline statistics are shown in **Table 1**. Compared with patients with STEMI, patients with NSTE-ACS were older, and had higher female proportion ($P < 0.05$) and higher serum creatinine levels ($P < 0.05$). The incidence of cardiovascular risk factors such as hypertension, diabetes and hypercholesterolemia in patients with NSTE-ACS was significantly higher than that in patients with STEMI ($P < 0.05$). In addition, the incidence of multivessel disease in NSTE-ACS patients was higher than that in STEMI patients ($P < 0.001$).

Cumulative long-term death risk of STEMI patients is higher than that of NSTE-ACS patients after PCI

To compare the short- and long-term survival between STEMI and NSTE-ACS patients after PCI, statistical analysis methods were used as described in Materials and Methods. Four-year cumulative survival rates are shown in **Figure 1**. The long-term cumulative mortality in patients with STEMI was higher (Log Rank $P = 0.037$), but this is mainly due to the fact that the early mortality was significantly higher (STEMI, 15.7%; NSTE-ACS, 1.4%). Four-year mortality in multivariate analysis showed that the risk of death in patients with STEMI was higher than that in patients with NSTE-ACS (HR 1.496, 95% CI 1.019-2.197). **Figure 2** shows the cumulative mortality of two groups between six months to four years. In this time-segment, NSTE-ACS patients had higher mortality, but without statistical significance (Log Rank $P = 0.469$). Multivariate analysis showed that the hazard ratio for death had no significant difference between NSTE-ACS and STEMI patients (HR 1.173, 95% CI 0.758-1.813). These data suggested that the cumulative long-term death risk of STEMI patients was higher than that of NSTE-ACS patients after PCI due to the increased early mortality within 6 months, but long-term follow-up after 6 months showed that NSTE-ACS patients had a slightly higher mortality.

Discussion

In this study, the mortality of patients with STEMI and NSTE-ACS was 15.7% and 1.4%, respectively. These worse in-hospital prognoses in STEMI could be attributed to a higher incidence of cardiogenic shock and cardiac rupture. Another reason for the high level of in-hospital mortality for STEMI patients could be the relatively long duration between the onset of symptoms to hospital admission. The reason why NSTE-ACS patients had higher mortality after 6 months may lie in the following aspects. First, age is a independent risk factor affecting elderly patients with acute myocardial infarction. Compared with STEMI patients, NSTE-ACS patients were older and had a higher proportion of older women. A Meta-analysis [7] pointed out that early invasive treatment strategy is not beneficial for low-risk woman NSTE-ACS patients, on the other hand NSTE-ACS patients can be given less guideline recommended medications when discharged [8]. These factors obviously affect the long-term prognosis of patients. Second, it is reported that NSTE-ACS patients have recurrent ischemia and high mortality [9]. Although no re-ischemic event statistics was shown in this study, the number of NSTE-ACS patients with multivessel disease was significantly higher. We speculate that the more severe the coronary artery disease is, the more possible the recurrent ischemia occurs. Third, early effective vascularization is beneficial for all STEMI patients by reducing myocardial necrosis and improving survival. However, it is still unclear whether early intervention therapy is beneficial for NSTE-ACS patients. Randomized clinical trials (RCTs) that have compared conservative versus invasive treatments in NSTEACS have shown that an invasive strategy reduced the incidence of MI but not death [10-12]. TIMing of Intervention in Acute Coronary Syndromes (TIMACS) trials showed that early invasive therapy improved the prognosis of high-risk patients, while patients in all studies had no improvement at 6 month primary endpoint [13]. A meta-analysis has shown the benefits of routine invasive strategy in reducing the incidence of death after hospital discharge but has found no benefit in terms of cumulative mortality [14].

In this study, there are some limitations. First, the sample number was relatively small because the information came from a single heart center. Second, we compared the long-term mortality of patients with acute coronary syndrome after PCI, but not all patients. In clinical practice, STEMI patients were more likely to receive primary PCI, while NSTE-ACS patients received

a lower proportion of intervention. Third, we lacked drug treatment on discharged patients and outpatient medication treatment situation, so the secondary prevention of coronary heart disease affecting long-term mortality was not estimated. Fourth, the composition of the patients' long-term mortality was not classified, and may be mixed with non-cardiac death.

STEMI patients had higher long-term mortality due to higher mortality of the acute event within six months, whereas the mortality of NSTE-ACS patients was slightly higher after six months. This suggests that in clinical practice, acute events in STEMI patients with early revascularization should be prevented. By contrast, most of NSTE-ACS patients are old and have concurrent disorders. They should be given more detailed guidance to increase medication adherence and normative, as well as better secondary prevention of coronary heart disease.

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Disclosure of conflict of interest

None.

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