Clinical Research

Risk factors of acute myocardial infarction following primary percutaneous coronary intervention among elderly patients

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Background and Objective  Large randomized controlled trials have demonstrated that percutaneous coronary intervention (PCI) with the routine use of drug-eluting stents is safe and effective; however, the patients older than 75 years undergoing PCI are at increased risk for major adverse cardiac events, so that the patients are usually excluded from this trial. The aim of the present study was to assess the early clinical outcome and risk factors in old patients with acute ST elevation myocardial infarction (STEMI) following primary PCI. Methods  We analyzed the outcome after stenting in 136 patients older than 60 years in our coronary care unit with acute STEMI, and the patients were further classified in 2 age groups: patients ≥75 years and <75 years. Results  Though the older group had a higher prevalence of adverse baseline characteristics and lower final TIMI flow than those of the younger, the procedural success had no difference between two groups. The main adverse clinical events (MACE) for the old group was a little higher comparing with the younger in 12-month following up. Conclusions  Our study suggest that drug-eluting stent implantation in elderly patients with acute ST elevation myocardial infarction has high initial procedural success rates despite having more severe baseline risk characteristics, and to shorten the time form symptom onset to PCI and improve final TIMI flow strategy may decrease MACE among old patients following PCI(J Geriatr Cardiol 2009; 6:67-70).

Key words  Acute myocardial infarction; percutaneous coronary intervention; elderly

Introduction

Treatment of acute myocardial infarction has changed dramatically during the 1990s, and the management of acute ST elevation myocardial infarction (STEMI) has undergone a revolutionary change with the introduction of primary percutaneous coronary intervention (PCI), which is now the standard of care for patients who come in within the first few hours of onset of chest pain, but PCI in elderly patients can be complicated by complex coronary anatomy with resultant higher complication and low success rates during PCI. Age remains as one of the most important predictors of adverse cardiovascular outcomes.¹⁻³ The aim of our comprehensive study was to characterize current clinical course and risk factors in STEMI patients aged 75 years or older with the routine use of drug-eluting stents (DESs).

Advanced age is associated with an increased mortality in acute myocardial infarction.⁴⁻⁷ The mechanism by which increasing age contributes so dramatically to mortality is unknown. This has been reported with both thrombolytic therapy and primary PCI.⁸⁻¹¹ In addition, to avoid the increased bleeding risk and intracranial hemorrhage, some early trials excluded aged patients.¹² In this study we addressed the question whether primary PCI is beneficial in elderly patients as compared with those in the younger cohorts.

Methods

Patient population

A total of 136 old patients (>60 years) with acute STEMI who underwent primary PCI within 12 hours of symptom onset were enrolled into this study, and the patients were further classified in 2 age groups: patients ≥75 years (old group) and <75 years (control group). All patients met the following criteria: 1) symptom of myocardial ischemia lasting> 30 min not responding to nitroglycerin infusion; 2) persistent ST-elevation by 0.2 mV in 2 contiguous precardial leads or by 1 mV in 2 limb leads on a 12-lead electrocardiogram; 3) enzyme changes [more than double the upper normal limits of creatine kinase (CK), CK-MB, or
relative index]. Medical history measures were drawn from previously coronary revascularization and prior myocardial infarction (MI), congestive heart failure, smoking status, diabetes, cerebrovascular disease, and the following characteristics ascertained at hospital admission: heart rate, Killip class, myocardial infarction location, renal dysfunction, anemia, and weight. All patients gave formal written consent before the procedure.

**Primary percutaneous coronary intervention**

If not contraindicated, emergency coronary angiography and angioplasty were performed by the femoral approach. At the time of admission in the coronary care unit, all patients received 300 mg of chewable aspirin and 600 mg clopidogrel. Stent diameter was chosen by the interventional cardiologist usually based on visual estimation of vessel size. Generally, in patients presenting with MI, only the infarct-related vessel was treated. The extent of coronary artery disease was measured by quantitative coronary artery angiography (QCA), which was defined by the number of significant plaques (estimated narrowing >50% diameter stenosis in a major vessel) and number of major vessels with disease. Multivessel disease was defined as 70% stenosis in 2 or more vessels. Heparin 7500 to 10000 IU were administered i.v. according to weight and operation time. All patients who received a coronary stent or more were treated for 4 weeks with aspirin 100 mg qd plus clopidogrel 75 mg qd. Beta-blockers and angiotensin converting enzyme inhibitors were routinely administered to all patients if not contraindicated.

**Angiographic analysis**

Angiographic analyses included coronary TIMI flow grading and final myocardial blush grade (MBG). Angiographic assessment was always performed by two independent angiographers and final agreement was 90%, with discordanaces being resolved by consensus. TIMI flow was assessed according to previous studies. MBG was assessed according to van’t Hof et al. criteria.13

**Clinical course and follow-up**

Main adverse clinical events (MACE), including death, reinfarction, target vessel revascularization, stroke and heart failure, were evaluated during the in-hospital and 12 months follow-up after stenting. Reinfarction after 24 hours was diagnosed on the basis of recurrent ischemic symptoms, of a CK-MB reelevation to above 3 times normal (> 2 times the normal value after day 7) and persistent (> 30 min) ST-elevation. Target lesion revascularization was defined as a repeat percutaneous intervention driven by a lesion located in the same segment treated during the index procedure and any CAGB performed after index procedure. Stroke was diagnosed on the basis of an imaging study (computed tomographic scan) and of the consultant neurologist’s opinions. Heart failure was diagnosed on the suggestive symptoms of physical findings and the opinion made by the radiologist from a chest radiograph demonstrating pulmonary edema and cardiomegaly and the brain natriuretic peptide (BNP) test, and even some on the ventricular function monitoring by cardiac ultrasound. Procedural success was defined as <20% residual stenosis in the treated lesion with no in-hospital events.

**Data analysis**

Absolute numbers and percentages are computed to describe the patient population. Data are expressed as mean± SD for continuous variables. Differences between the means of continuous variables were tested using unpaired Student’s t tests and chi-square analysis. A P value < 0.05 was considered statistically significant. Cardiac event-free survival curves were constructed by Kaplan-Meier analysis. The tests were performed using the SAS 8.0 (SAS Institute; Cary, NC USA).

**Results**

**Patient characteristics**

There were 55 patients ≥ 75 years and 81 from 60 to 75 years of age. As can be seen Table 1, compared with control group, the old group had a higher prevalence of dyslipidemia and/or hypercholesterolemia, hypertension, previous MI or stroke, low Killip class degree and had more time from symptom onset to PCI. They were also significantly more likely to be women.

**Angiographic and procedural characteristics**

Angiographic and procedural data are listed in Table 2. Mltivessel disease was more frequent in elderly patients than the younger, and a final TIMI flow and MBG was observed lower in old patients than those in the control. However, the procedural success had no difference between two groups.

**Endpoint**

During the follow-up period, 39 patients (28.8%) were reported with the MACE in the entire group. There were significant differences between two groups (old 21, 38.2 % vs. younger18, 22.2 %, P=0.0434), Fig 1.

**Discussion**

As life expectancy continues to increase, cardiologists will observe an ever increasing number of elderly patients with acute MI. In the past decade, the elderly undergoing PCI had traditionally higher rates of procedure-related death and complications.14.15 Some studies have demonstrated worse initial and long-term outcomes in elderly patients who underwent PCI compared with younger patients. With improved stent designs and PCI techniques
have lead to a striking improvement of the outcome after PCI in older patients. Primary PCI could represent an attractive alternative treatment for these patients. The main finding in the present study is that stenting in older patients has a high initial procedural success (92.7%) despite the fact that the risk profile of the older is considerably higher than younger patients; the MACE in old patients are somewhat higher than the younger's, most probably for their longer hours from symptom onset to PCI, high Killip degrees and low TIMI flow after the procedure; the symptom to PCI time and final TIMI flow after the procedure were the main risk factors for predicting 12-month cardiovascular events in all 3 60 acute STEMI.

In our study population, though no significant difference in occurrence rates of diabetes, uric acid and fasting blood glucose between two groups, older patients represented a high-risk population (exceeding more dyslipidemia or hypercholesterolemia, more hypertension, Previous MI or stroke, and Killip class ≤ II), which using more time from symptom onset to PCI. In addition we found more women were enrolled in the old group.

Our study demonstrates that despite no differences were found in infarct-related artery location and it’s diameter, even no differences in driver usage and ≥ 2 stents implantation between two groups, the final TIMI flow and MBG were low in old patients compared with that in the younger. The old had higher occurrence rates of MACE than the younger in 12 months follow up.

In conclusion, in this study the time from symptom onset to PCI, a changing factor, may play an important role in this unsatisfied results among old patients PCI within hospital following-up, besides Killip class. This indicates that saving the time from symptom onset to PCI should be an alarm for the older patients’ adverse outcome, especially for the women patients.
Figure 1 Kaplan-Meier survival curves for patients with ST-segment elevation myocardial infarction. The event-free rate in the elderly is significantly lower than that in the younger (p< 0.001).

Study limitations

These results were achieved in an experienced interventional single center with a planned program of primary PCI for acute MI patients, and may not be reproducible in all centers. Larger long-term studies are required to determine the clinical value of these results.

References