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Selection of percutaneous coronary intervention in elderly patients with acute myocardial infarction in tertiary hospital

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Abstract

To investigate the status of percutaneous coronary intervention (PCI) in elderly patients with acute myocardial infarction (AMI) and analyze the reasons for not receiving PCI.

A cohort of 387 consecutive hospitalized AMI patients aged ≥80 years were recruited from 2005 to 2014. Their clinical data were collected and analyzed.

Among 387 elderly patients with AMI (190 men and 197 women, mean age 84.1 ± 3.9 years), there were 171 patients with ST-elevation myocardial infarction (STEMI) and 216 patients with non-ST-elevation myocardial infarction (NSTEMI). The emergency and elective PCI treatment rate was 40.6% and 12.1%, respectively, in patients with STEMI; and 1% and 18%, respectively, in patients with NSTEMI. PCI treatment rate of elderly AMI patients enrolled after 2009 showed no significant difference compared to that before 2009 ($P > .05$). The in-hospital mortality decreased significantly in PCI treatment group. After adjustment for age, sex, and other factors, PCI treatment was identified as the independent protective factors for in-hospital mortality (odds ratio = 0.323, 95% confidence interval 0.147–0.710, $P = .005$). The main influence factors for not receiving PCI treatment were hemorrhage, severe renal dysfunction, infection, or severe anemia-associated complications, whereas delayed treatment was the important reason for patients not undergoing emergency PCI.

PCI treatment is the independent protective factor for in-hospital mortality of elderly patients with AMI. Due to various complications, PCI treatment rate is still low in elderly patients with AMI and has not been improved recently. Paying attention to performing PCI treatment for elderly patients with AMI has positive significance.

Abbreviations: AMI = acute myocardial infarction, CI = confidence interval, NSTEMI = non-ST-elevation myocardial infarction, OR = odds ratio, PCI = percutaneous coronary intervention, STEMI = ST-elevation myocardial infarction.

Keywords: acute myocardial infarction, elderly, percutaneous coronary intervention

1. Introduction

Presently, the aging population is growing rapidly in China and all over the world. Meanwhile, the incidence of coronary heart disease increases rapidly with age. Acute myocardial infarction (AMI) has become the leading cause of death in people older than 65 years. In particular, patients with AMI aged 80 and older have high morbidity and mortality.[1]

Recent studies have shown that the prevention of coronary heart disease help decrease AMI mortality significantly, especially the mortality of AMI dropped to 4% to 6% with percutaneous coronary intervention (PCI).[2–9] However, PCI treatment rate of elderly patients with AMI is still low due to reasons such as more complications; atypical symptoms; delayed treatment (a delay in transfer from home or a hospital without acute coronary care center to the cardiac center with the possibility for PCI); and mild to complicated renal dysfunction, infection, and severe anemia, which caused high mortality of elderly patients with AMI.[5,6]

In order to provide a guide for PCI strategies in elderly patients with AMI during their admission, in this study, we investigated the in-hospital emergency and elective PCI treatment status of elderly patients with AMI who were admitted to our hospital within 10 years, examined the effect of PCI treatment on in-hospital mortality, and analyzed the reasons why patients with AMI did not receive PCI treatment.

2. Subjects and methods

1.1. Subjects

This study was approved by institutional review board and all patients provided written informed consent. Consecutive 410 cases of patients with AMI including patients with ST-elevation myocardial infarction (STEMI) and non-ST-elevation myocardial infarction (NSTEMI) aged 80 and older were admitted to Fuxing hospital, Capital Medical University from October 2003 to October 2012. Twenty-three cases were excluded because of missing clinical data.

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Diagnostic criteria of AMI referred to standards in "2007 ACC/AHA unstable angina and non-ST elevation myocardial infarction diagnosis and treatment guidelines" and "2009 ACC/AHA acute ST elevation myocardial infarction diagnosis and treatment guidelines."[10,11] The other diseases were diagnosed according to the rules in international or Chinese Medical Association guidelines.

1.2. Statistical analysis

SPSS 16.0 was used for statistical analysis. Normally distributed measurement data were expressed as mean ± standard deviation (x±s), non-normally distributed data as median (M) and enumeration data as percentage. Independent sample *t* was used to compare measurement data between 2 groups, whereas Pearson χ^2 was used to compare enumeration data. The effect of PCI treatment on in-hospital prognosis was analyzed by binary single-factor and multifactor logistic regression. $P < .05$ was considered statistically significant.

3. Results

1.3. Basic clinical characteristics of elderly patients with AMI

Among all 387 elderly patients with AMI, there were 171 patients with STEMI and 216 patients with NSTEMI. The average age was 84.1±3.9 years, including 190 men aged 84.3±4.1 years and 197 women aged 83.3±3.5 years.

1.4. 3.2 PCI treatment status of elderly patients with AMI

Total 133 patients received PCI treatment during hospitalization, accounting for 34.4% of all elderly patients with AMI. In patients with STEMI and NSTEMI, especially in patients with NSTEMI, PCI treatment rate was still low (Table 1). There were 217 patients with AMI before 2009 and 170 patients with AMI since 2009. PCI treatment rate since 2009 showed no significant difference compared to that before 2009 in both patients with STEMI and patients with NSTEMI patients (Table 2).

1.5. PCI treatment decreased in-hospital mortality of elderly patients with AMI

For patients with STEMI, in-hospital mortality was 14% in patients with PCI and 35.9% in non-PCI patients. The in-hospital mortality decreased significantly in PCI group compared to non-PCI group ($\chi^2 = 11.181$, $P = .001$). For patients with NSTEMI, the in-hospital mortality of PCI group (0.0%) also decreased significantly compared to non-PCI patients (22.9%).

Table 1

Hospital treatment selection of elderly patients with acute myocardial infarction.

	Emergency PCI	Elective PCI	Conservative therapy	Coronary angiography without PCI
STEMI patients	67 (40.6)	20 (12.1)	68 (41.2)	10 (6.1)
NSTEMI patients	2 (1)	37 (18)	146 (71.2)	20 (9.8)
Total	69 (18.6)	57 (15.4)	214 (57.8)	30 (8.1)

NSTEMI = non-ST-elevation myocardial infarction, PCI = percutaneous coronary intervention, STEMI = ST-elevation myocardial infarction.

Table 2

Percutaneous coronary intervention treatment selection of elderly patients with acute myocardial infarction before and after 2009.

	PCI treatment before 2009	PCI treatment after 2009	Total
STEMI patients	57 (50.0)	36 (63.2)	93 (54.4)
NSTEMI patients	20 (17.7)	20 (19.4)	40 (18.5)

STEMI: $\chi^2 = 2.652$, $P = .103$; NSTEMI: $\chi^2 = 0.105$, $P = .745$.
NSTEMI = non-ST-elevation myocardial infarction, PCI = percutaneous coronary intervention, STEMI = ST-elevation myocardial infarction.

Binary logistic regression analysis showed that PCI treatment during hospitalization significantly reduced the risk of death for elderly patients with AMI [odds ratio (OR) = 0.303, 95% confidence interval (CI) 0.166–0.553, $P < .001$]. After adjustment for age, sex, previous myocardial infarction, hypertension, diabetes, and risk factors of stroke, in-hospital PCI treatment was the independent protective factor for in-hospital mortality (OR = 0.323, 95% CI 0.147–0.710, $P = .005$).

1.6. The influence factors for not receiving PCI treatment in elderly patients with AMI

A total of 254 elderly patients with AMI did not receive PCI treatment. The main influence factors of patients with STEMI (78 cases) were the presence of complications (accounting for 74.4%, of which hemorrhage correlated complications were 30.8%; severe renal dysfunction, infection, or severe anemia were 33.3%; and other complications were 10.3%); patients or their families refused PCI operation (12.5%), and others (13.1%). The main influence factors of patients with NSTEMI (176 cases) were the presence of complications (accounting for 79.5%, of which hemorrhage correlated complications were 37.5%; severe renal dysfunction, infection, or severe anemia were 36.9%; and other complications were 5.1%); patients or their families refused PCI operation (18.5%); and others (2%). Delayed treatment was the important reason for not receiving emergency PCI operation (STEMI was 95.0%; NSTEMI was 59.5%).

4. Discussion

This study showed that in-hospital PCI treatment was the independent protective factor for in-hospital mortality of elderly patients with AMI, whereas the emergency and elective PCI treatment rates were still low in these patients, especially the emergency PCI treatment rate was only 1% in patients with NSTEMI. In addition, PCI treatment rate of elderly AMI patients since 2009 showed no significant improvement compared to that before 2009. The main factors that prevented elderly patients with AMI receiving PCI treatment were complications such as hemorrhage, renal dysfunction, and infection, and the patient's or family's will. Delayed treatment was the important reason why patients were not receiving PCI treatment.

AMI has become the leading cause of death in people older than 65 years. Numerous studies have shown that a positive PCI treatment could significantly improve the prognosis of patients with AMI and reduce the mortality of patients with AMI within 1 month.[2–9] This study also showed that elderly AMI could benefit from PCI treatment. Moreover, the in-hospital mortality of PCI treatment group reduced significantly for both patients with STEMI and NSTEMI. Logistic regression analysis showed

that PCI treatment was the independent protective factor for in-hospital death.

Despite significant decrease in mortality risk from coronary heart disease,[7] this study demonstrated no improvement in PCI treatment rate of patients with AMI since 2009, which suggested that elderly patients with AMI did not get better benefit with medical development. All studies on patients older than 65 years hospitalized for AMI showed that their mortality within 1 month was up to 10.9% to 31.2%.[12–14] We analyzed the reasons why elderly patients with AMI were not receiving PCI treatment. Gastrointestinal or brain hemorrhage, combining with renal dysfunction, infection, and severe anemia were main reasons of low PCI treatment rate in elderly patients with AMI, whereas delayed treatment was the important reason patients with STEMI were not receiving emergency PCI treatment. Furthermore, old age is an important factor for delayed transfer and treatment. In addition, due to the old age, some patients and their families refused invasive rescue.

This is a single-center clinical study, which might cause some selection bias. This is one important limitation of this study. Despite the limitation, our study suggests that PCI treatment is the independent protective factor for in-hospital mortality of elderly patients with AMI, although PCI treatment rate is still low and there has not been improvement in recent years in these patients. Taking appropriate measures against the influence factors of PCI treatment of elderly patients with AMI has positive significance to ensure the performance of PCI and improve the survival of these patients.

Author contributions

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