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Original Article / Оригинални рад

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Clinical characteristic and management of elderly patients with myocardial infarction

Клиничке карактеристике и збрињавање старијих болесника са инфарктом миокарда

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SUMMARY

Introduction/Objective Population of elderly people is increasing and modern medicine is faced with the problem of large morbidity and mortality from cardiovascular diseases in this age group. Modern treatment strategies have not been sufficiently investigated in the elderly, therefore these people often receive suboptimal treatment. The aim of the study was to evaluate clinical characteristic, cardiac risk factors, management strategies and early outcome in the elderly patient with ST elevated myocardial infarction (STEMI).

Methods This retrospective study included 217 consecutive patients, aged ≥ 70 years (mean age 77.6 ± 4.9 years, 103 men, 114 women) with STEMI admitted to the Institute of Cardiovascular Diseases of Vojvodina. We have analyzed patients' clinical characteristics, risk factors, left ventricular function and treatment strategies in relation to in-hospital outcome.

Results First clinical symptom was chest pain in 209 (96.3%) of patients. On admission, 35 (16,1%) patients were with severe signs of heart failure (Killip class III–IV). Duration of symptom onset to hospital admission was 14.7 ± 28.6 hours. Out of 217 patients, 168 (77.4%) patients received reperfusion treatment, including primary percutaneous coronary intervention (PPCI) in 164 (75.6%) patients, and fibrinolytic therapy in 4 (1.8%) patients. Hospital mortality was 26.3% (57 patients). PPCI was univariate predictor of lower in-hospital mortality, whereas multivariate predictors of in-hospital mortality were cardiogenic shock (OR 67.095; 95%CI (6.845–657.646); p < 0.001) and low ejection fraction (OR 0.901; 95%CI (0.853–0.963); p = 0.001).

Conclusion In elderly patients presenting with STEMI, PPCI was associated with lower mortality, whereas cardiogenic shock and lower ejection fraction were independent predictors of worse prognosis after STEMI.

Keywords: ST elevated myocardial infarction; primary percutaneous coronary intervention; fibrinolysis, elderly

САЖЕТАК

Увод/Циљ Популација старијих људи је у порасту и модерна медицина се сусреће са проблемом великог морбидитета и морталитета од кардиоваскуларних болести у овој старосној групи. Модерне стратегије лечења још увек нису довољно испитане код старијих, пре свега ови људи често буду субоптимално лечени. Циљ истраживања је да се испитају клиничке карактеристике, кардиолошки фактори ризика, стратегије збрињавања и рани исход код старијих болесника са инфарктом миокарда са *ST* елевацијом (*STEMI*).

Методе Ретроспективна студија је укључила 217 узастопних болесника животне доби ≥ 70 година (средње животне доби 77,6 ± 4,9 година, 103 мушкараца и 114 жена), са *STEMI* примљених у Институт за Кардиоваскуларне болести Војводине. Анализиране су клиничке карактеристике, фактори ризика, функција леве коморе и стратегије лечења у односу на болнички исход болести.

Резултати Први клинички симптом је био бол у грудима који је био заступљен у 96,3% болесника. При пријему 35 (16,1%) је имало озбиљне знаке срчане слабости (*Killip* класа III–IV). Време од појаве тегоба до пријема у болницу је било 14,7 ± 28,6 сати. Од 217 болесника 168 (77,4%) је добило реперфузиони третман, укључујући примарну перкутану коронарну интервенцију (*PPCI*) у 164 (75,6%) болесника и 4 (1,8%) фибринолизу. Хоспитални морталитет је био 26,3% (57 болесника). *PPCI* је био универијантни предиктор ниског интрахоспиталног морталитета, а мултиваријантни предиктори хоспиталног морталитета су кардиогени шок (*OR* 67.095; 95% *CI* (6.845–657.646); *p* < 0.001) и ниска ејекциона фракција леве коморе (*OR* 0.901; 95% *CI* (0.853–0.963); *p* = 0.001).

Закључак Код старијих болесника са *STEMI*, *PPCI* је била повезана са мањим болничким морталитетом, док су кардиогени шок и ниска ејекциона фракција леве коморе били независни предиктори лошије прогнозе после *STEMI*.

Кључне речи: инфаркт миокарда са *ST* елевацијом; примарна перкутана коронарна интервенција; фибринолиза, старији

INTRODUCTION

Older adults make up an increasingly large proportion of acute coronary syndrome (ACS) [1, 2]. About 60% of hospital admissions for ACS are patients over 65, and

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approximately 85% deaths occur in this age group. Large registries have shown that about 24–28% of ST-elevation myocardial infarction (STEMI) admissions belong to the patients aged > 75 year [3]. Other studies also confirmed higher in-hospital and long-term mortality from STEMI in patients older than 70 years [2, 4].

In Serbia, as in most developing countries, there is a trend of population aging and the proportion of patients over 65 years has increased from 8.9% in 1971 to 19.2% of population in 2016. In last decades, cardiovascular diseases were the leading cause of mortality in Serbia with 51.7% of all deaths in 2016, and 17.5% due to ischemic heart disease (about 50% from acute coronary syndrome) [5]. According to the latest reports from the population-based Registry of Acute Coronary Syndrome in Serbia [6], out of all newly diagnosed MI in 2016, 44.2% men and 40.3% women were over 70 years old. Incidence rate of MI for the population was 259.7 for men and 157.3 for women, and the highest incidence was in patients > 75 years, for men 963.5 and the women 721.1 per 100,000 population [6]. Mortality rate was also highest in the oldest group: 77.7 for men and 48.6 for women < 75 years, but in patients > 75 years of age significantly increased to 413.9, and 306.8 per 100,000, for men and women respectively [6].

Age is not only a risk factor for cardiovascular disease; it is also an independent risk factor for adverse outcomes after cardiovascular events, including short-term morbidity (stroke, heart failure and shock) and mortality in patients with STEMI treated with percutaneous coronary intervention (PCI) [7]. In study APEX-AMI mortality after 90 days was 13.1% in patients > 75 years and 2.3% at patients < 65 years [8].

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Since patients older than 65 years are frequently not well-represented in clinical trials, the effect of treatment is not well documented, particularly for primary PCI (PPCI) and novel medical therapies [3, 4, 8]. However, guidelines have recommended invasive strategy for patients with STEMI irrespective of age, but still there is deficiency of evidence [9, 10, 11].

The aim of this study was to evaluate clinical characteristics, cardiac-risk factors, management strategies and intra-hospital outcome in the elderly (≥ 70 years) patients with STEMI.

METHODS

The retrospective study included 217 consecutive elderly (≥ 70 years) patients with STEMI, 103 (47.5%) men (mean age 77.2 ± 4.6 years), and 114 (52.5%) female (mean age 78.4 ± 5.1 years; p = 0.78) admitted during 2015 at the Institute of Cardiovascular Diseases of Vojvodina.

Acute myocardial infarction was defined according to the ESC Third universal definition of myocardial infarction [12] by significant elevation of cardiac biomarkers in addition to at least one of these criteria: clinical presentation, electrocardiographic abnormalities as persistent ST segment elevation in contiguous leads 1 mm or more; definite T-wave inversion; evolution of pathologic Q-waves; or new onset left bundle branch block (LBBB). STEMI was defined with symptoms of ischemia, ST-segment elevation in at least two contiguous leads, or new onset LBBB and positive cardio specific enzymes [9].

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In all patients initial clinical, laboratory, and standard 2D echocardiography examination was performed, including evaluation of left ventricle wall motion analysis, and ejection fraction (LVEF) [13].

Reperfusion strategy was defined as: primary reperfusion with PPCI or thrombolysis - when the patient received fibrinolytic agent; no reperfusion therapy when the patient did not receive any reperfusion treatment. PPCI were performed in patients with myocardial ischemia < 12 hours of duration, or regardless of the time from symptoms onset in case of ongoing ischemia, hemodynamic instability or malignant arrhythmias. PCI in asymptomatic patients > 48 h after onset of symptoms was not performed. Thrombolysis with alteplase was initiate in patients < 12 hours of symptom when PPCI was refused and there were no contraindications to fibrinolysis.

All patients were given standard therapy according to the ESC guideline for STEMI and according to clinical presentation [9]. Regardless of the type of reperfusion strategy, all patients received a loading dose of aspirin (300 mg) and continued with 100 mg daily, as well as clopidogrel (300–600 mg loading dose followed by 75 mg dose once daily) or ticagrelor (180 mg loading dose, followed by 90 mg maintenance dose twice daily). PPCI was performed according to the standard protocol.

Protocol for fibrinolytic strategy with alteplase was following: 15 mg alteplase i.v. bolus, then continuous infusion of 0.75 mg/kg over 30 min and then 0.5 mg/kg over 60 minutes alteplase, followed by unfractionated heparin bolus (60 U/kg i.v.) and continued with enoxaparin 1 mg/kg s.c. twice daily for maximum eight days. For patients ≥ 75 years, loading dose of clopidogrel was omitted, and subcutaneous dose of enoxaparin was reduced to 0.75 mg/kg.

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Non-reperfused patients with STEMI received aspirin, clopidogrel, and enoxaparin with same dosages as in patients receiving fibrinolytic therapy.

In patients with chronic kidney disease and eGFR< 30ml/min / 1.73m², dose of enoxaparin was adjusted (0.75 mg/kg s.c. once daily)

ECG, laboratory and clinical follow-up was systematically performed throughout hospital stay, and all adverse events were recorded including mortality, repeated signs of myocardial ischemia, bleeding, heart failure, cardiogenic shock and stroke.

Congestive heart failure at the time of presentation was estimated by Killip's classification [14]. Major bleeding was defined as bleeding requiring transfusion and/or prolonged hospital stay and/or causing a drop-in hemoglobin > 3 g/l [15].

Stroke was defined as the development of new neurologic deficit not present on initial examination, neurologist diagnosis of stroke, or diagnosed by computed tomography imaging [16].

Statistical analysis

Descriptive statistics were generated for all study variables, including means and standard deviations (SD) for continuous variables and relative frequencies for categorical variables. One sample Students t test, Mann-Whitney test and Chi-Square test were performed to evaluate statistically significant differences between groups. Univariate and multivariate logistic regression analyses were used to determine predictors of in-hospital mortality. Statistical significance was defined as p value of 0.05. All statistical analyses were performed using SPSS version 17.0 for Windows.

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RESULTS

During the one-year period, 2,306 patients were admitted to the Coronary Care Unit, including 1,314 (57.0%) patients < 70 years, 715 (31.0%) patients 70–80 years, and 277 (12.0%) were > 80 years. One-third of all patients (756) were admitted with STEMI diagnosis, including 217 (28.7%) patients > 70 years of age (114 female vs. 103 male, 52.5% vs. 47.5% p = 0.455).

Basic clinical characteristics of examined patients are presented in Table 1. Initial and dominant clinical symptom was chest pain, presented in 209 (96.3%) patients, whereas dyspnea as a dominant symptom was reported in seven (3.2%) patients, and fatigue in one patient (0.5%). Typical ECG for STEMI had 209 (96.3%) patients, seven (3.2%) had LBBB and one (0.5%) had a pacemaker.

Killip classification on admission was following: 140 patients (64.5%) had no evidence of heart failure or Killip I class; 42 patients (19.4%) had Killip II; 17 patients (7.8%) had pulmonary edema or Killip III; and 18 patients (8.3%) had cardiogenic shock or Killip IV. Mean time from symptom onset to hospital admission was 14.7 ± 28.6 hours. Mean LV EF was reduced to 46 ± 11.6%; with 130 (59.9%) patients having EF < 50%.

A total of 168 (77.4%) patients received reperfusion therapy including 164 (75.6%) with PPCI, and only four (1.8%) received fibrinolytic therapy (Table 2). There were 49 (22.6%) patients without primary reperfusion therapy, and not all of the patients underwent coronary angiography (28 patients or 57.1%). Two (0.9%) patients went to urgent surgical revascularization or coronary artery bypass grafting (CABG), whereas nine (4.1%) were referred to cardiac surgery, and 17 (7.8%) for PCI. Out of 164 patients undergoing PPCI, in

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82 (50%) infarct-related artery was left anterior descendent coronary artery, in 58 (35.4%) right coronary artery, and in 18 (10.9%) patients was circumflexis artery; in six patients (3.7%) culprit lesion could not be defined.

The most frequently in-hospital complication was heart failure developed in 37 patients (17.1%), and cardiogenic shock in 31 patients (14.3%), followed by recurrent myocardial ischemia in 16 patients (7.4%), ventricular arrhythmias in 34 patients (15.2%), and AV block in 12 patients (5.5%). Subcutaneous hematoma as complication of femoral arterial punction was recorded in five patients (2.8%), but with no indication for surgical treatment of hematoma.

Mortality rate during hospitalization was 26.3% or 57 patients, including 21 men and 36 women. Seven patients (3.2%) were resuscitated in cath lab and died because of cardiac arrest during PPCI. There was borderline difference in mean age between survivors and non-survivors, respectively (76.9 ± 4.6 vs 78.2 ± 4.4 years, $p = 0.056$), and interestingly no difference in time from symptom onset to admission (14.8 vs 14.3 hours, $p = 0.907$). Survivors had significantly higher LVEF ($48.1 \pm 10.5\%$ vs $34.7 \pm 11.1\%$, $p < 0.01$), higher systolic (145.9 ± 26.2 vs 108.2 ± 51.5 mmHg, $p < 0.01$), and diastolic blood pressure on admission (85.5 ± 15.5 vs 61 ± 33.6 mmHg, $p < 0.01$). In-hospital mortality rate for Killip class III–IV was 24/35 (69%) (Table 1).

By univariate regression analysis (Table 3), predictors of in-hospital mortality were Killip class III–IV (OR 3.094; 95%CI 2.156–4.439; $p < 0.001$**),** no reperfusion therapy (OR 2.750; 95%CI 1.400–5.402; $p = 0.003$), heart failure (OR 7.421; 95%CI 1.501–34.475; $p = 0.007$, cardiogenic shock (OR 93.56; 95%CI 10.981–797.206; $p < 0.001$), low ejection fraction (OR 0.919: 95% CI 0.877–0.964; $p < 0.001$). PPCI was a predictor for better survival (OR 0.364; 95%CI 0.185–0.714, $p = 0.003$. Independent multivariable predictors of in-

hospital mortality were cardiogenic shock (OR 67.095; 95%CI (6.845–657.646); $p < 0.001$) and low ejection fraction (OR 0.901; 95%CI (0.853–0.963); $p = 0.001$).

DISCUSSION

Our study demonstrated that in elderly patients with STEMI, initial and dominant clinical symptom was chest pain, but still, about 20% was admitted after > 12h of symptom onset accompanied by symptoms of heart failure (35.5%). The most common in-hospital complications of STEMI were heart failure, cardiogenic shock, ventricular arrhythmias and AV blocks. The other disturbing findings of our study is extremely high in-hospital mortality rate of 26.3%, despite reperfusion and PPCI in > 75% of the patients. Thus, the main predictors for the worst outcome were absence of reperfusion therapy, Killip III–IV, heart failure, AV block, whereas low left ventricular EF and cardiogenic shock were independent predictors of in-hospital events. Additionally, patients undergoing PPCI had better in-hospital survival.

In our study, symptoms of myocardial infarction were typical, with chest pain in 96% of patients, which is consistent with previous data [17]. However, atypical symptoms like dyspnea, nausea and syncope [18, 2] may be one of the reasons for a delay of elderly patients' arrival to the hospital. It has been shown that the time from onset of symptoms to hospital admission of these patients was prolonged compared to younger patients [2, 18], measured as first medical contact time and total ischemic time ($p < 0.001$) [16, 19]. Schoenenberger et al. [20] found that the delay from symptom onset to hospital admission of patients ≥ 70 years decreased between 2001 and 2012 in acute myocardial infarction in Switzerland (AMIS) cohort.

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In our study, there was no significant difference between the time from symptom onset to admission of surviving and deceased patients, but both groups had very late presentation for STEMI treatment with a mean time delay of 14.7 ± 28.6 hours. The delay to STEMI treatment was very well appreciated medical issue and independent predictor of in-hospital mortality [19].

As shown earlier and confirmed in our study, elderly patients with STEMI were more often female [2, 16], with higher rate of mortality in men [21]. Regarding comorbidities, only chronic renal failure significantly correlated with in-hospital mortality in our patients, also consistent with previous studies [3, 22]. Congestive heart failure is more frequently in older population with IM [16, 20, 23], and appeared to be an important predictor of poor outcome [7, 22] regardless of appropriate therapeutic approach [7], and more elderly patients with STEMI had higher Killip class > 1, including cardiogenic shock, compared to younger patients [16, 21, 24]. Widimsky et al. [25] compare importance of Killip class on the outcome after PPCI in relation to the age of patients, and found that in-hospital mortality of Killip IV patients was 69% (elderly group), 54% (65–74 years, $p < 0.001$) and 27% (< 65 years, $p < 0.001$). In the same cohort in-hospital mortality of patients with Killip II–III was significantly lower in all age groups: 4% (elderly), 2.7% (65–74 years) and 0.8% (< 65 years).

In patients with STEMI, IMMEDIATE trial [26] has demonstrated that lower LVEF was significantly associated with 1-year mortality or hospitalization for heart failure. For every 5 % LVEF reduction, the hazard ratio [HR] was 1.26 (95% CI 1.15, 1.38, $p < 0.001$). The presence of LV dysfunction on baseline left ventriculography in patients enrolled in the HORIZONS–AMI trial who underwent PPCI was a powerful predictor of early and late

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mortality irrespective of the extent of coronary artery disease [27]. In our patients lower EF was also related to higher mortality.

As the clinical presentation of acute MI varies by age and presence of co-morbidities, many physicians use the "first not harm" strategy for elderly population who are at higher mortality risk, and they are often undergo a more conservative and sub-optimal treatment [11], despite the benefit of more invasive and aggressive approach [2, 8]. Numerous observations and studies proved that these patients could have significant benefit from PPCI in the settings of STEMI [1, 11, 24]. Angeli et al. [28] in the meta-analysis of nine randomized trials found that early revascularization in elderly patients with MI reduced the risk of rehospitalization, recurrent myocardial infarction or death to a greater extent compared to younger patients. One of the trials examined the effect of PPCI instead of fibrinolytic therapy in elderly patients with STEMI [24] The death rates were 7.7%, 15.0%, and 19.9% with PPCI, fibrinolysis, and no reperfusion ($p < 0.001$), respectively. There was no difference in the rates of hemorrhage stroke and other major bleeding between groups. Authors concluded that early reperfusion, especially PPCI, was safe and effective with absolute reduction of mortality compared with no reperfusion in patients ≥ 75 years old [24]. Our data are consistent with earlier findings, demonstrating PPCI as a favorable predictor of prognosis [1, 8, 14]. In addition, TRIANA study [29] showed advantage of PPCI compared to fibrinolysis concerning mortality, reinfarction and stroke during 30 days. (OR 0.64; 95% IP 0.45–0.91).

Still, STEMI network is less efficient in elderly than younger patients [19], as they received both thrombolytic and invasive procedures less frequently when compared with younger patients [1, 23, 30]. However, recent registries observed trend of increase rate of aggressive treatment of STEMI in elderly, especially PPCI [8, 20, 30].

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One of the major concerns in elderly population is bleeding and neurological disorders [1]. However, rates of hemorrhagic stroke (0.3%, 0.6%, and 0.1%) and other major bleeding (3.0%, 5.0%, and 3.1%) were similar for primary PCI, fibrinolysis, and no reperfusion group in elder with IM [24]. In our study, neurological complications were observed in small number of patients, stroke in 2.8% and mental disorders in 3.7%.

Mortality in elderly patients with acute MI was higher than in young population [2, 16, 24]. Mortality in this study was 26.3%, similar to 28.4% found by Lovleen et al. [23], in STEMI patients > 65 years, but still unacceptably high.

Study limitations

The major limitation of this study was relatively small number of patients, and quite a long-time interval between symptoms onset and admission to the hospital, which is far beyond recommended time frames for optimal reperfusion. Most probably, the explanation for high in-hospital mortality is long time delay accompanied with all complications of acute MI including low LVEF, heart failure and cardiogenic shock. In addition, not all relevant angiographic and procedure variables were included and analyzed, as TIMI flow grade, SYNTAX score defining angiographic complexity, as well as other procedure characteristics (additional medications, inotropis support, etc).

CONCLUSION

Elderly patients represent a significant and increasing proportion of STEMI patients. In our study population, elderly patients with STEMI presented with typical symptoms of chest

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pain, but with unacceptably long delay between symptom onset and hospital admission and a very high in-hospital mortality. Cardiogenic shock and low LVEF were independent predictors of in-hospital mortality, whereas early reperfusion with PPCI significantly reduced in-hospital mortality. Our findings support the need for comprehensive health care STEMI network that will enable efficient care of patients with STEMI, particularly in elderly patient which per se represents most vulnerable subgroup of STEMI patients with worse prognosis.

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Table 1. Selected baseline and clinical characteristics at presentation among elderly patients with STEMI

Baseline characteristics	**All patients (n = 217)**	**Survived (n = 160)**	**Died (n = 57)**	**p value**
Male gender, n (%)	103 (47.5)	82 (51.3)	21 (36.8)	0.061
Age 70–80 years, n (%)	163 (75.1)	126 (78.8)	37 (64.9)	0.038
Age over 80 years, n (%)	54 (24.9)	34 (21.3)	20 (35.1)	0.038
Age (years), mean±SD	77.2 ± 4.6	76.9 ± 4.6	78.2 ± 4.4	0.056
Time from symptom onset to admission (h), (mean, 95% confidence interval for mean)	14.7 (9.98–20.6)	14.8 (10–19.6)	14.3 (8.59–20)	0.907
Systolic blood presure (mmHg), mean ± SD	136.2 ± 38.5	145.9 ± 26.2	108.2 ± 51.5	< **0.01**
Diastolic blood pressure (mmHg), mean ± SD	79.1 ± 24.2	85.5 ± 15.5	61 ± 33.6	< **0.01**
Heart rate (b.p.m.), mean ± SD	80.5 ± 21.1	81 ± 18.5	79 ± 27.3	0.544
Ejection fraction (%), mean ± SD	46.0 ± 1.6	48.1 ± 10.5	34.7 ± 11.1	< **0.01**
Admission symptoms, n (%)				
Pain	209 (96.3)	155 (96.9)	54 (94.7)	0.436
Dyspnea	7 (3.2)	4 (2.5)	3 (5.3)	0.383
Weakness	1 (0.5)	1 (0.6)	0	1.000
Killip class, n (%)				
I	140 (64.5)	119 (74.4)	21 (36.8)	< **0.05**
II	42 (19.4)	30 (18.8)	12 (21.1)	0.855
III	17 (7.8)	11 (6.9)	6 (10.5)	0.553
IV	18 (8.3)	0	18 (31.6)	< **0.05**
Risk factors, n (%)				
Dyslipidemia	44 (2.3)	37 (23.1)	7 (12.3)	0.080
Current smokers	55 (25.3)	46 (28.8)	9 (15.8)	0.053
Hypertension	184 (84.8)	138 (86.3)	46 (80.7)	0.317
Family history	36 (16.6)	29 (18.1)	7 (12.3)	0.308
Diabetes mellitus, n (%)	62 (28.6)	44 (27.5)	18 (3.6)	0.186
Treatment with oral antidiabetics	46 (21.2)	31 (19.4)	15 (26.3)	0.362
Treatment with insulin	16 (7.4)	13 (8.1)	3 (5.3)	0.570
Glucose intolerance	16 (7.4)	15 (9.4)	1 (1.8)	0.076
Disease history, n (%)				
Previous myocardial infarction	11 (5.1)	6 (3.8)	5 (8.8)	0.138
Previous PCI	2 (0.9)	1 (0.6)	1 (1.8)	0.444
Previous CABG	3 (1.4)	1 (0.6)	2 (3.5)	0.111
Chronic renal failure	12 (5.5)	5 (3.1)	7 (12.3)	**0.009**
Blood test on admission, mean ± SD				
Creatine kinase (mmol/l)	1062.7 ± 1226.7	1042.6 ± 1221.2	2079.0 ± 1303.7	0.148
Creatine kinase myocardial band (mmol/l)	114.6 ± 125.2	113.3 ± 126	180.7 ± 49.2	0.358

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Table 2. Treatment and in-hospital outcomes among elderly patients with STEMI

Treatment, n (%)	**All patients (n = 217)**	**Survived (n = 160)**	**Died (n = 57)**	**p value**
PPCI	164 (75.6)	129 (80.6)	35 (61.4)	**0.005**
Fibrinolysis	4 (1.8)	2 (1.3)	2 (3.5)	0.282
Primary reperfusion	168 (77.4)	131 (81.9)	37 (64.9)	**0.005**
No primary reperfusion	49 (22.6)	29 (18.1)	20 (35.1)	**0.005**
Complications, n (%)				
Recurrent ischemia	16 (7.4)	8 (5)	8 (14)	0.052
Hematoma	5 (2.3)	3 (1.9)	2 (3.5)	0.608
Cardiac arrest - VT/VF	16 (7.4)	8 (5)	8 (14)	0.052
Atrial fibrillation	17 (7.8)	12 (7.5)	5 (8.8)	0.984
AV block	12 (5.5)	5 (3.1)	7 (12.3)	**0.024**
Shock	31 (14.3)	1 (0.6)	30 (52.6)	**< 0.05**
Heart congestion	37 (17.1)	17(10.6)	20 (35.1)	**0.009**
Stroke	6 (2.8)	2 (1.3)	4 (7)	0.070
Cognitive disturbances	8 (3.7)	7 (4.4)	1 (1.8)	0.684

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Table 3. Univariate and multivariate predictors* of in-hospital mortality

Variable	Odds ratio	95% C.I.	p-value
Killip class III–IV	3.094	2.156 – 4.439	< **0.001**
Systolic blood pressure	0.969	0.958 – 0.981	< **0.001**
Diastolic blood pressure	0.953	0.935 – 0.971	< **0.001**
Low ejection fraction	0.919	0.877 – 0.964	< **0.001**
Renal failure	4.340	1.319 – 14.281	**0.016**
PPCI	0.364	0.185 – 0.714	**0.003**
No reperfusion	2.750	1.400 – 5.402	**0.003**
AV block	4.340	1.319 – 14.281	**0.016**
Shock	93.564	10.981 – 797.206	< **0.05**
Heart congestion	7.421	1.501 – 34.475	**0.007**
Low ejection fraction *	0.901	0.853 – 0.963	**0.001**
Shock*	67.095	6.845 – 657.646	< **0.001**

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