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Long-term Outcomes of Elderly Patients with Acute Myocardial Infarction; Different Prognosis between ST Elevation and non-ST Elevation Myocardial Infarction

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Abstract

Background & objectives Recently, elderly patients with acute myocardial infarction (AMI) are increasing rapidly, and some of them presented as non-ST elevation myocardial infarction (NSTEMI), but their long-term clinical outcomes are not well-defined in Korea.

Methods From Nov 1st 2005 to Dec 31st 2008, 239 patients with AMI admitted to our hospital. They were divided into four aged groups; ≥75 (group 1; n=60, 79.8±4.4), 65-74 (group 2; n=62, 69.6±3.0), 50-64 (group 3; n=72, 57.0±3.9), <50 years old (group 4; n=45, 43.9±5.0).

Results More patients with group 1 were women and non-smokers, and complained of atypical chest pain. Serum NT-proBNP level was higher, and hospital stays were longer in the group 1. Doppler echocardiographic study of the mitral inflow showed less restrictive filling pattern in the group 1. Previous histories of DM and ischemic heart disease, Killip classification, maximal CK-MB and troponin T level, left ventricular EF, and proportions of NSTEMI were not different among groups. 1-year survival, and major adverse cardiac event (MACE)-free survival were not significantly different (p=0.17, and 0.92, respectively). Subgroup analysis of patients with ST-elevation MI (STEMI) showed the lowest 1-year

survival rate of group 1 (p=0.0067), but not patients with NSTEMI (p=0.46).

Conclusions Elderly patients with AMI showed somewhat different clinical manifestations. Long-term survival rate was lower only in STEMI. Elderly patients with NSTEMI had similar long-term clinical outcomes.

Key words: Myocardial infarction, Coronary artery disease, Aged, Prognosis

Introduction

The incidence and prevalence of myocardial infarction (MI) are increasing progressively with aging. In the United states, over 60% of acute myocardial infarction (AMI) occurred in patients 65 years of age or older, and approximately one third occurred in persons over age 75 years.[1] MI remains the leading cause of hospitalization as well as of death worldwide. Over the past several decades, substantial advance in the medical management of patients hostipalized with AMI have been accompanied by reductions in in-hospital clinical complications and short-term death rates.[2,3] But, both in-hospital and long-term mortality are significantly higher in the elderly, regardless of the type of treatment.[4,5,6]

There are a few papers comparing the long-term prognosis of ST-segment elevation myocardial infarction (STEMI) and non-ST-segment elevation myocardial infarction (NSTEMI). Although similar in-hospital mortality rates have been described in NSTEMI versus STEMI[7], most studies have reported higher hospital case-fatality rates among STEMI patients.[8,9] One study comparing of STEMI with NSTEMI outcomes in a large registry database (KAMIR) showed that the in-hospital survival rate was higher in NSTEMI patients than in STEMI patients. However, the 1-year survival rate was not different between the two groups.[10]

There were no clearly defined clinical outcomes in the old ages between STEMI and

NSTEMI in Korea. The objective of this study was to compare long-term outcomes in the elderly patients hospitalized for STEMI and NSTEMI in Korea.

Materials and Methods

We enrolled 239 patients with AMI, admitted to Jeju National University Hospital from Nov 1st 2005 to Dec 31st 2008. When the patients met two of three MI criteria, they were diagnosed as MI. MI criteria were chest pain over 30 minutes, elevated cardiac markers and the presence of electrocardiographic features of MI (in STEMI patients). Adding to MI criteria, STEMI diagnostic criteria included an ST segment elevation of ≥2mm in adjacent chest leads and/or an ST segment elevation of >1mm in two or more standard leads or new left bundle branch block (LBBB). NSTEMI was diagnosed in the absence of ST segment elevation and positive cardiac necrosis markers. The study patients were stratified into four groups; ≥75 (group 1; n=60, 79.8±4.4), 65-74 (group 2; n=62, 69.6±3.0), 50-64 (group 3; n=72, 57.0±3.9), <50 years old (group 4; n=45, 43.9±5.0). And we compared baseline characteristics, in-hospital mortality, 1-year survival, 1-year major adverse cardiac event (MACE)-free survival among those groups. The MACE included death, reperfusion and myocardial infarction.

Statistical analysis

Continuous data were presented as mean ± standard deviation (SD) and percent (%) was used as a unit of categorical data. ANOVA was used for comparing data between groups.

Once the result was statistically significant in ANOVA test, Scheffe test was performed to verify whether the result had a real significance. To analyze the prognosis of MI, we used Kaplan-Meier estimates and log-rank test. Statistical significance was taken if p value <0.05. Statistical analyses were performed using SPSS version 18.0 for Window (SPSS, Inc., Chicago, IL, USA)

Results

Baseline characteristics

More patients with group 1 were women (p<0.001), non-smokers (p<0.001), hypertensive (p=0.007), showed longer hospital stay (p=0.004) and complained of atypical symptoms (p<0.001) and dyspnea (p=0.017). Body mass index (p<0.001) and the percentage of patients transferred from other hospital (p=0.043) were lower in the group 1. But, there were no differences among all groups in blood pressure, heart rate and the proportion of diabetes mellitus, ischemic heart disease, previous angina and NSTEMI. After admission, no one had thrombolytic therapy in group 1. Killip classes and the proportion of percutaneous coronary intervention (PCI) were not different among all groups (Table 1).

Serum NT-proBNP and CRP level were higher (p<0.001, p=0.014) and serum triglyceride level was lower (p=0.009) in the group 1. Serum creatinine, total cholesterol, HDL and LDL-cholesterol, maximal CK-MB and maximal troponin T were not different among the study groups (Table 2). Doppler echocardiographic study of the mitral inflow showed less restrictive filling pattern in the group 1 (p=0.022). There were no differences in left ventricular end diastolic dimension (LVEDD), left ventricular end systolic dimension (LVESD) and left ventricular ejection fraction (LVEF) among all groups (Table 3).

Table 1. Baseline characteristics

	Group 1 (n=60)	Group 2 (n=62)	Group 3 (n=72)	Group 4 (n=45)	p value
Age (years)	79.8±4.4	69.6±3.0	57.0±3.9	43.9±5.0	<0.001
Female	34 (53.1%)	21 (32.8%)	9 (14.1%)	0 (0%)	<0.001
BMI (kg/m^2)	22.94±2.91	24.20±2.41	24.88±2.64	26.62±4.22	<0.001
Systolic BP (mmHg)	128.3±30.7	132.9±30.6	123.7±32.3	125.7±25.1	0.350
Diastolic BP (mmHg)	78.2±19.3	79.3±17.4	78.4±20.2	81.2±16.9	0.848
Heart rate (/min)	73.9±22.9	78.3±21.5	67.4±15.7	76.3±16.5	0.009*
Hypertension	39 (65.0%)	41 (66.1%)	42 (58.3%)	16 (35.6%)	0.007
Diabetes mellitus	18 (30.0%)	12 (19.4%)	18 (25.0%)	5 (11.1%)	0.115
Smoker	10 (16.7%)	24 (38.7%)	33 (45.8%)	34 (75.6%)	<0.001
Ischemic heart disease	9 (15.0%)	11 (17.7%)	17 (23.6%)	7 (15.6%)	0.568
Transfer from other hospitals	18 (30.0%)	33 (53.2%)	29 (40.3%)	25 (55.5%)	0.043
Atypical Symptoms	15 (25.0%)	5 (8.1%)	3 (4.2%)	3 (6.7%)	0.001
Chest pain	50 (83.3%)	57 (91.9%)	68 (94.4%)	43 (95.6%)	0.083
Dyspnea	27 (45.0%)	14 (22.6%)	22 (30.6%)	9 (20.0%)	0.017
Previous angina	19 (31.7%)	20 (32.3%)	32 (44.4%)	13 (28.9%)	0.256
Killip class 1	37 (61.7%)	41 (66.1%)	53 (73.6%)	32 (71.1%)	0.351
Killip class 2	12 (20.0%)	10 (16.1%)	10 (13.9%)	12 (26.7%)	
Killip class 3	7 (11.7%)	7 (11.3%)	5 (6.9%)	1 (2.2%)	
Killip class 4	4 (6.7%)	4 (6.5%)	4 (5.6%)	0 (0%)	
NSTEMI	26 (43.3%)	18 (29.0%)	26 (36.1%)	13 (28.9%)	0.310
PCI	49 (81.7%)	55 (88.7%)	64 (88.9%)	39 (86.7%)	0.610
Thrombolytic therapy	0 (0%)	4 (6.5%)	4 (5.6%)	2 (4.4%)	0.288
Hospital stay (days)	8.3±6.9	6.9±4.3	5.3±2.6	5.9±3.2	0.004

*: Only group 2 vs group 3.

BMI: Body mass index, BP: blood pressure, NSTEMI: Non ST-elevation myocardial infarction, PCI: Percutaneous coronary intervention

Table 2. Laboratory findings

	Group 1 (n=60)	Group 2 (n=62)	Group 3 (n=72)	Group 4 (n=45)	p value
Serum creatinine (mg/dL)	1.26±0.68	1.13±0.31	1.21±0.85	1.02±0.22	0.217
Total cholesterol (mg/dL)	179.9±41.4	195.8±43.5	189.1±39.6	200.4±46.2	0.086
Triglyceride (mg/dL)	111.4±59.4	132.2±94.1	141.3±92.5	176.1±126.8	0.009
HDL-cholesterol (mg/dL)	45.4±12.2	43.9±12.2	43.1±10.8	43.2±11.7	0.719
LDL-cholesterol (mg/dL)	113.6±36.0	129.0±36.7	122.2±35.2	127.9±40.4	0.122
CRP (mg/dL)	1.68±3.27	1.71±2.63	0.59±1.33	0.57±1.23	0.014
Max CK-MB (ng/mL)	153.8±155.5	211.3±245.7	192.1±177.6	149.2±129.6	0.235
Max Troponin T (ng/mL)	3.00±5.77	2.34±4.13	1.34±2.56	2.38±3.44	0.148
NT-proBNP (pg/mL)	3582.6±4594.1	1088.15±1502.3	697.3±1857.5	331.6±635.3	<0.001

CRP: C-reactive protein

Table 3. Echocardiographic findings

	Group 1 (n=60)	Group 2 (n=62)	Group 3 (n=72)	Group 4 (n=45)	p value
LVEDD (mm)	48.8±6.1	49.1±5.9	50.2±6.2	50.0±3.6	0.574
LVESD (mm)	33.4±7.3	33.2±7.2	33.6±6.5	33.9±4.9	0.969
LVEF	54.9±10.4	53.7±11.4	55.4±10.3	56.6±8.5	0.573
E (cm/sec)	70.5±24.1	67.8±23.4	68.9±16.4	74.5±18.3	0.438
A (cm/sec)	95.4±26.3	83.7±22.1	70.7±15.8	60.1±14.8	<0.001
E/A ratio	0.78±0.39	0.84±0.36	1.02±0.33	1.29±0.40	<0.001
Deceleration time (msec)	260.8±90.1	233.8±67.5	202.6±49.8	204.7±49.2	<0.001
E' (cm/sec)	3.95±1.04	4.57±1.15	5.63±1.39	6.66±1.76	<0.001
A' (cm/sec)	7.85±1.77	8.44±1.42	8.32±1.90	8.01±1.36	0.280
E/E'	19.1±8.9	15.5±6.0	12.9±4.3	11.6±2.9	<0.001
Restriction	15.6%	24.5%	39.0%	40.5%	0.022

LVEDD: Left ventricular end diastolic dimension, LVESD: Left ventricular end systolic dimension, LVEF: Left ventricular ejection fraction

Discharge medications

When the patients discharged, furosemide was prescribed more often in the group 1 patients (p=0.026). The reason why more furosemide was prescribed in the group 1 was that there were more patients with pulmonary congestion in that group. Other medications such as aspirin, clopidogrel, beta-blocker, ACE inhibitor, calcium-channel blocker, or statin were prescribed without statistical differences (Table 4).

Table 4. Discharge medication

	Group 1 (n=60)	Group 2 (n=62)	Group 3 (n=72)	Group 4 (n=45)	p value
Aspirin	98.0%	100%	100%	100%	0.352
Clopidogrel	92.2%	93.1%	96.9%	93.0%	0.694
Beta-blocker	72.5%	70.7%	83.1%	81.4%	0.296
ACE inhibitor	70.6%	60.3%	63.1%	62.8%	0.718
ARB	13.7%	12.1%	13.8%	7.0%	0.710
ACEi or ARB	84.3%	72.4%	76.9%	69.8%	0.349
CCB	9.8%	15.5%	9.2%	2.3%	0.176
Nitrate	43.1%	43.1%	49.2%	41.9%	0.852
Furosemide	13.7%	6.9%	3.1%	0%	0.026
Spironoloactone	5.9%	3.4%	1.5%	0%	0.317
Statin	72.5%	82.8%	81.5%	90.7%	0.158

ACE inhibitor: Angiotensin converting enzyme inhibitor, ARB: Angiotensin receptor blocker, CCB: Calcium channel blocker

Prognosis

In-hospital mortality, 1-year survival rate and 1-year MACE-free survival rate were not significantly different among four groups (Figure 1 & 2). Subgroup analysis of patients with STEMI showed the lowest 1-year survival rate in group 1 (73.5% vs. 90.9%, 84.8%, 100%, respectively; p=0.0067) (Figure 3 & 4), but not patients with NSTEMI (96.2% vs. 94.4%, 96.2%, 84.6%, respectively; p=0.46) (Figure 5 & 6) (Table 5).

Table 5. In-hospital mortality, 1-year survival and 1-year MACE-free survival rates

	Group 1 (n=60)	Group 2 (n=62)	Group 3 (n=72)	Group 4 (n=45)	p value
In-hosp. mortality	13.3%	6.5%	9.7%	3.3%	NS
1-yr survival	83.3%	91.9%	88.8%	95.6%	0.169
1-yr MACE-free survival	76.7%	75.8%	80.6%	77.8%	0.921
STEMI (n=156)					
1-yr survival	73.5%	90.9%	84.8%	100%	0.0067
1-yr MACE-free survival	70.6%	77.3%	78.3%	84.4%	0.359
NSTEMI (n=83)					
1-yr survival	96.2%	94.4%	96.2%	84.6%	0.456
1-yr MACE-free survival	84.6%	72.2%	84.6%	61.5%	0.314

MACE: Major adverse cardiac event, STEMI: ST-segment elevation myocardial infarction, NSTEMI: non ST-segment elevation myocardial infarction

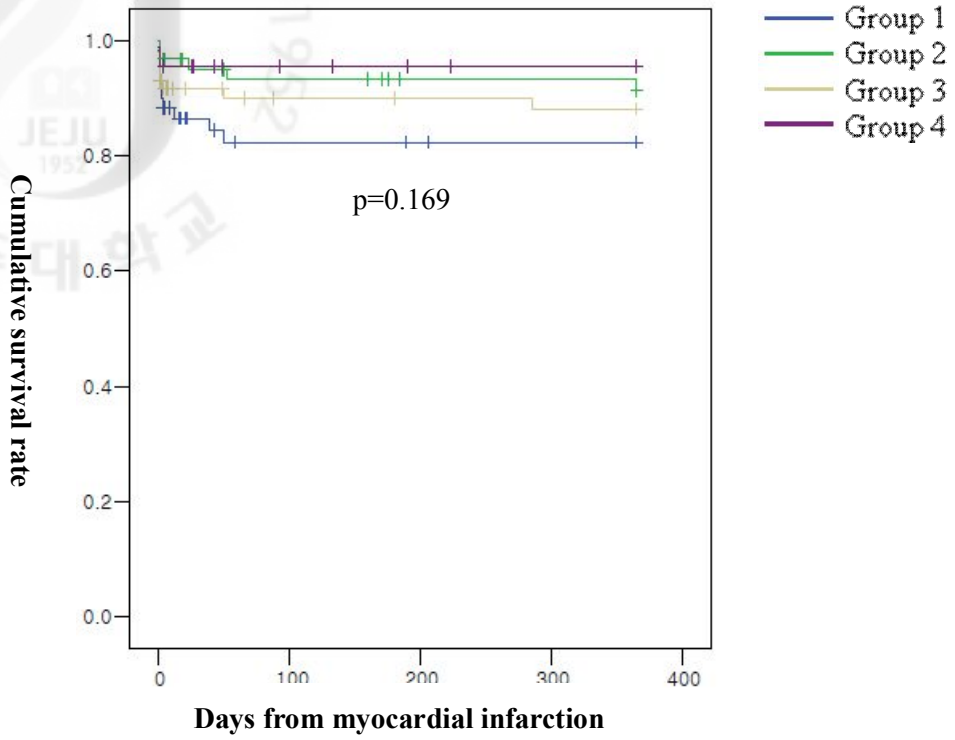

Figure 1. Kaplan-Meier 1-year survival rate

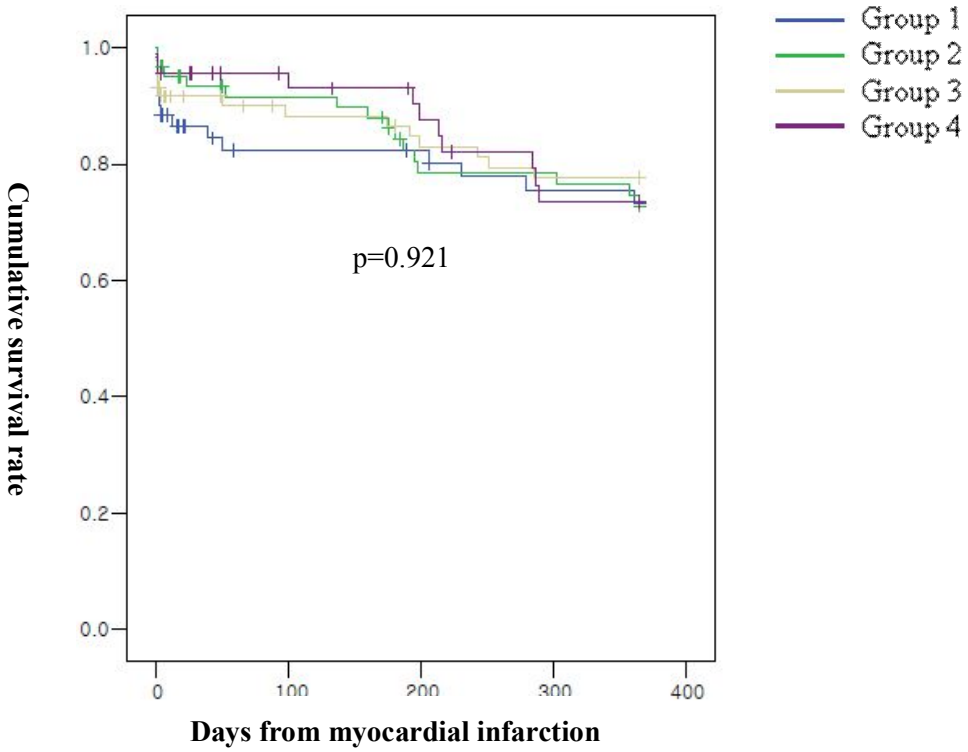

Figure 2. Kaplan-Meier 1-year MACE-free survival rate

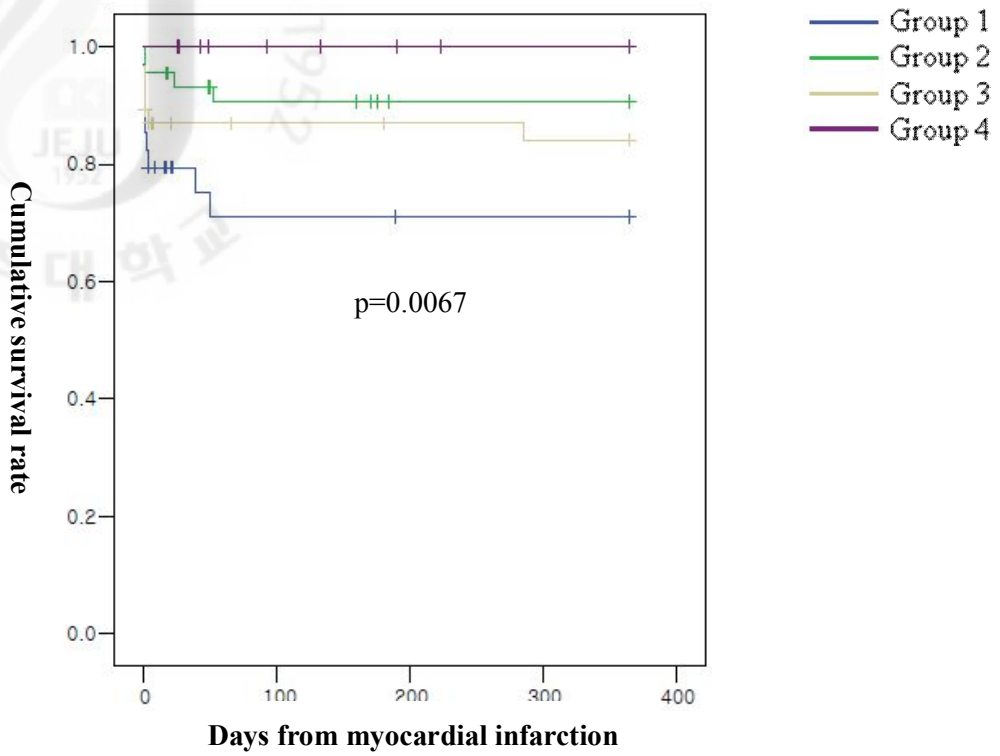

Figure 3. Kaplan-Meier 1-year survival rate in STEMI patients

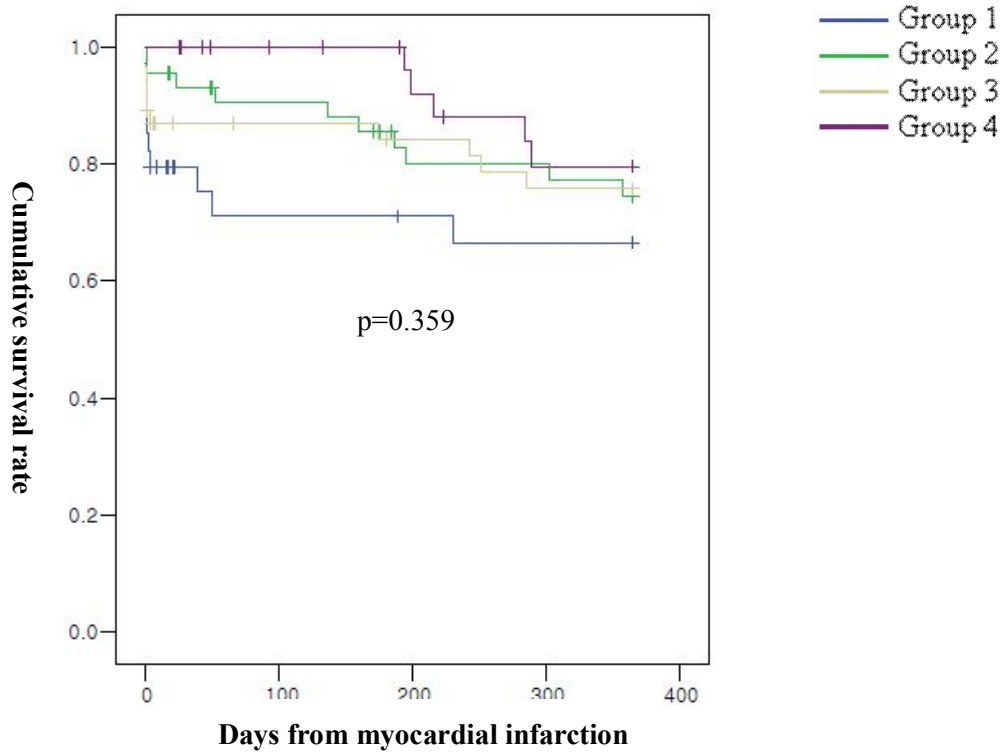

Figure 4. Kaplan-Meier 1-year MACE-free survival rate in STEMI patients

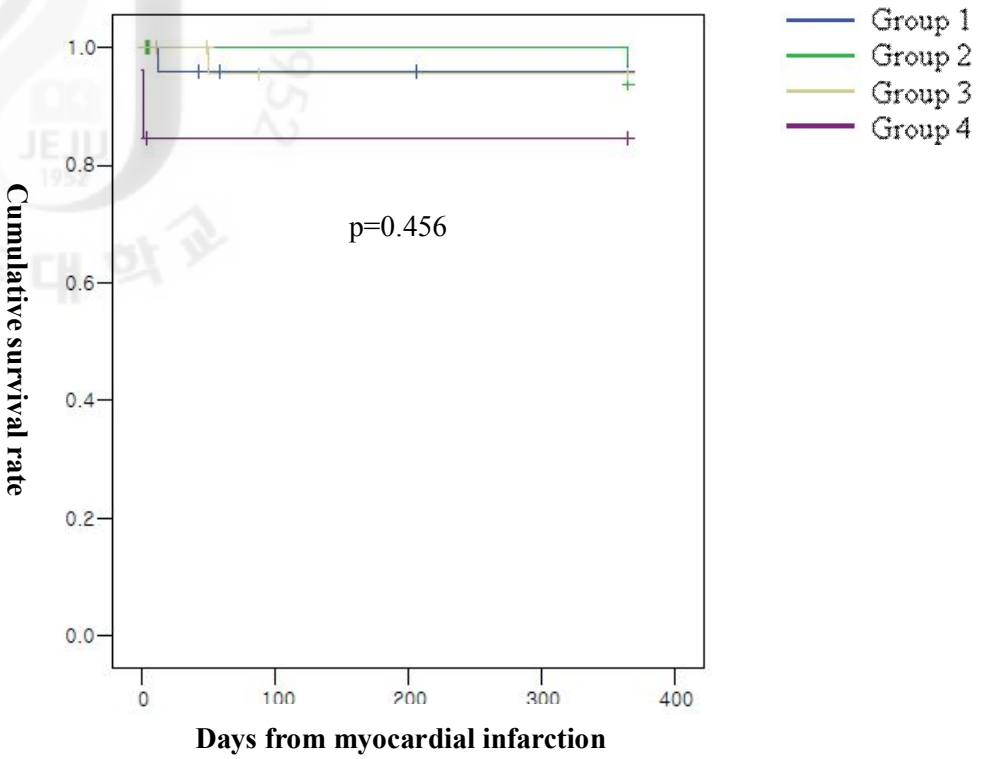

Figure 5. Kaplan-Meier 1-year survival rate in NSTEMI patients

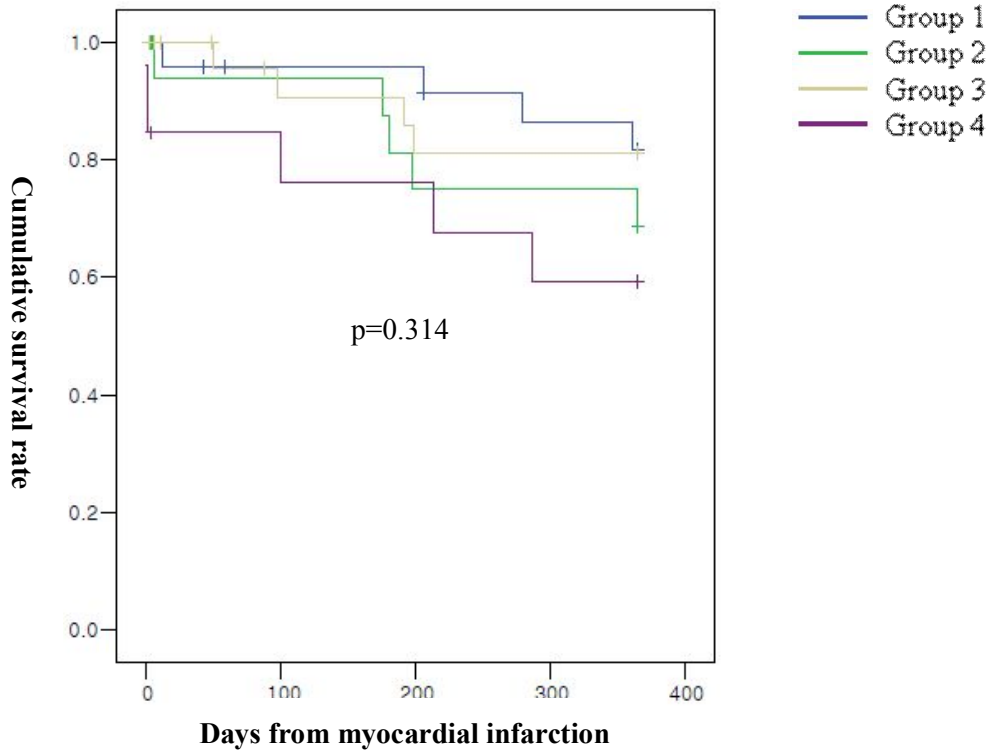

Figure 6. Kaplan-Meier 1-year MACE-free survival rate in NSTEMI patients

Discussion

The purpose of this study was comparing long-term outcomes in elderly patients with relatively younger patients hospitalized for STEMI and NSTEMI in Korea. There was no statistical difference in 1-year survival and 1-year MACE free survival in aged over 75 years patients compared to younger patients. Subgroup analysis of patients with STEMI showed significantly lower 1-year survival rate in elderly patients. But, 1-year survival rate in NSTEMI patients showed no statistical difference in aged over 75 years patients compared to other groups.

There were several papers comparing the prognosis between STEMI and NSTEMI. But, inconsistent results were derived. Manari A. et al. reported higher 30-day mortality of patients with STEMI than those with NSTEMI. However, in patients with NSTEMI, the mortality rate increased after discharge, becoming close to that seen in STEMI patients at 6 months.[11] They explained the reason of increased mortality rate in NSTEMI patients that whereas patients with STEMI usually underwent emergent revascularization, the clinical scenario in NSTEMI was extremely variable and high-risk patients did not undergo coronary angiography at the times. Kozuch M. et al. showed, on the other hand, the highest mortality during the hospitalization and a 2-year follow-up was observed in the STEMI group.[12] And also, Anna F. et al reported that during the 12-month long-term follow up, mortality rates

were significantly higher in STEMI than in NSTEMI patients.[13] Above two papers presented similar independent prognostic factors for increased mortality including age, diabetes, impaired LV systolic function, cardiogenic shock and STEMI.

Lech P. et al. suggested the unadjusted long-term prognosis was worse in NSTEMI patients in comparison to STEMI patients and they thought this result might be associated with the more unfavorable clinical characteristics of NSTEMI patients.[14] After adjustment for baseline characteristics and treatment strategies, the long-term prognosis was worse in STEMI patients.

The clinical manifestation of MI in elderly patients differs in many aspects as compared to younger patients. But, the factors affecting the course of MI in the elderly have not been studied in detail. Aleksander G. et al. reported the coexistence of several diseases may cause the clinical pictures of acute coronary syndrome to be uncharacteristic.[15] In the first hours of MI, the elderly are more likely to complain of symptoms other than typical chest pain. They usually describe dyspnea, fatigue, dizziness, and confusion. Even when classic ischemic discomfort is present, it tends to be less severe and less well defined because of their reduced pain perception.[16] The cardiac risk factor profile of elderly patients with MI is also different. Older patients are mostly women with a history of heart failure and MI, and risk factors are predominantly diabetes mellitus and hypertension. But smoking, dyslipidemia and family

history seem not to be widespread risk factors in the elderly.[15] In our study, over half of the elderly patients were women, and they had more tendency in having hypertension and atypical chest pain, less tendency in smoking and obesity. But, there was no difference in history of diabetes mellitus and ischemic heart disease.

Contrary to general expectation, LVEF of patients with MI showed no significant differences between all groups. One possible reason was that no echocardiographic data from people who died before or during procedure could be included in the data pool.

Our study was a retrospective study performed at a single institution and the total number of included patients was relatively small. Therefore, we need to perform further study with a greater number of additional MI patients to evaluate more accurate relevance of survival rate of MI between young people and elderly.

Through this study, we knew that older people had a more tendency to complain of atypical chest pain shortly after heart attack. The 1-year survival rate of STEMI over the age of 75 was worse. But, there was no difference of 1-year survival rate of NSTEMI between young people and elderly. So, we should pay more attention to the elderly patients with atypical chest discomfort to evaluate quickly whether they have acute coronary syndrome. After that, rapid and proper treatment efforts should be followed to the elderly patients with NSTEMI. Because the chance of survival after NSTEMI in elderly is not different from younger people.

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