Prognostic Impact of Atrial Fibrillation in Patients with Acute Myocardial Infarction

（急性心筋梗塞患者における心房細動合併の予後への影響）

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Abstract

Background:

Atrial fibrillation (AF) is a most common supraventricular tachyarrhythmia in patients with acute myocardial infarction (AMI). However, little is known about the impact of AF on in-hospital and long-term mortalities in patients with AMI in the era of primary percutaneous coronary intervention (PCI).

Methods:

The consecutive 694 patients with AMI admitted within 48 hours after the symptom onset were analyzed. All patients underwent successfully primary PCI at acute phase of AMI. Patients were divided into 2 groups according to the presence of AF at admission or during index hospitalization. We evaluated in-hospital and long-term all-cause mortalities between patients with AF and without it retrospectively.

Results:

AF was detected in 38 patients (5.5%) at admission and in 51 (7.3%) during hospitalization. Patients with AF were older, had a higher heart rate, a lower ejection fraction, a higher prevalence of hypertension, a worse renal function, a higher peak level of CPK, and a lower rate of final TIMI flow grade 3 than those without AF. Although patients with AF had more complicated clinical course

and higher in-hospital mortality (11.2% vs. 4.0%, P=0.009), there was no significant association between presenting AF and in-hospital death after adjustment for baseline confounders (odds ratio, 2.63; 95% confidence interval (CI), 0.91-5.47; P=0.076). During follow-up period of 3.0±1.7 years, patients with AF had a higher all-cause mortality than those without it (30.3% vs. 22.1%, p=0.004 by log-rank test). However, after adjustment for clinical characteristics, presenting AF was not an independent predictor for all-cause mortality (hazard ratio, 1.15; 95%CI, 0.67-1.88; p=0.588).

Conclusions:

AF was a common complication of AMI and associated with more complicated clinical course. However, it was not an independent predictor for both in-hospital and long-term mortality in the PCI era.

Introduction

Atrial fibrillation (AF) is the most common supraventricular tachyarrhythmia seen in patients with acute myocardial infarction (AMI). It has been reported that AF occurs in 5 to 23% of patients with AMI [1]-[4]. AF is triggered by many different reasons, including left ventricular dysfunction with hemodynamic impairment [5][6], atrial ischemia or infarction [7], pericarditis, chronic lung disease, acute hypoxia, or electrolyte abnormalities [8][9]. AF occurring during acute phase of AMI may adversely affect left ventricular function and exacerbate ongoing myocardial ischemia. The bidirectional interaction between AF and myocardial dysfunction or ischemia may lead to a vicious circle in patient with AF complicating AMI. Some studies have identified increased in-hospital and long-term mortality associated with AF [1][10]-[13], though others have found no independent effect [2][3][14]-[17]. Most studies on AF complicated with AMI were performed in the prethrombolytic or thrombolytic era. Current treatment for AMI includes not only aspirin, β blockers, and thrombolytic therapy, but angiotension-converting enzyme inhibitors (ACE-I), angiotensin II receptor blockers (ARB), statin, and percutaneous coronary intervention (PCI)[18]. It has been demonstrated that PCI is a more effective treatment strategy in patients with AMI than

thrombolytic therapy [19][20], and use of primary PCI has dramatically increased [21]. However, little is known about in-hospital and long-term mortalities in patients with AMI and AF in the PCI era. We examined the impact of AF on in-hospital and long-term mortalities in patients with AMI.

Methods

Study patients

This study protocol was approved by the Ethical Committee on Human Research of our institution. The consecutive 694 AMI patients who were transferred to Hirosaki University Hospital within 48 hours after the symptom onset and underwent primary PCI at acute phase of AMI from February 2006 to April 2010 were enrolled. The diagnosis of AMI was made by chest pain lasting ≥20 minutes and/or electrocardiographic (ECG) changes suggestive of myocardial infarction or ischemia (≥0.1mV ST-segment elevation or depression in 2 or more contiguous leads and/or appearance of new Q wave), accompanied by an increase of creatine phosphokinase myocardial isoform (CPK-MB) and/or cardiac troponin T value greater than upper reference limit. AF was defined electrocardiographically as absence of P waves, coarse or fine fibrillation waves

and completely irregular R-R interval, and was diagnosed by 12-lead ECG or ECG monitoring by at least two cardiologists.

The study population was divided into 2 groups: patients who had AF at admission or who developed AF during hospitalization (Any-AF group) and those without AF (Non-AF group). Subsequently, the Any-AF group was further divided into 2 subgroups: patients who had AF at admission (AF at admission) and those who did not have AF at admission but developed AF during the index hospitalization (AF during hospitalization). Patients with a previous history of paroxysmal or transient AF but without a recurrence of AF during the index hospitalization were categorized into Non-AF groups.

Primary PCI

Primary PCI was performed in accordance with ACC/AHA/SCAI Practice Guidelines for Percutaneous Coronary Intervention [22]. Patients admitted within 12 hours of symptom onset were indicative of primary PCI. Those admitted within 36 hours of AMI onset complicated with cardiogenic shock or those admitted after 12 hours but within 24 hours complicated with severe heart failure, hemodynamic or electrical instability, or evidence of persistent ischemia also underwent primary PCI. In the patients who were admitted >12 hours after AMI onset and hemodynamically and electrically stable, primary PCI

was not performed. For PCI, bare metal stent was used when stent was indicated.

Endpoints

The primary endpoint of the study was all-cause death. We evaluated in-hospital and long-term all-cause mortalities retrospectively. We also examined the association of AF with in-hospital events, including congestive heart failure (CHF), cardiogenic shock, ventricular tachycardia/fibrillation (VT/VF), stroke, and length of hospitalization. Follow-up started from the day of admission. The patients were followed for 3.0±1.7 years. After hospital discharge, follow-up data were obtained from the following three ways: reviewing patients' hospital records, interviewing the patients through telephone and examining the patients in outpatient clinics.

Statistical analysis

Continuous parameters were expressed as mean ± SD and categorical variables as number and percentage. Comparative analysis among groups was performed with Student's *t* test or ANOVA for continuous variables and chi-square test for categorical variables. For comparison of Non-AF, AF at admission and AF during hospitalization, Tukey's HSD multiple-comparison procedure was used to identify where the differences among the 3 groups

occurred after the significant ANOVA. A multivariate logistic regression model was used to analyze factors that influenced the prevalence of AF. The following variables were entered into the model: age >65 years, male gender, heart rate at admission>100/minute, left ventricular ejection fraction (LVEF) <40%, anterior myocardial infarction (MI), peak level of creatine phosphokinase (CPK) >3000IU/L, final TIMI flow grade 3, Killip class at admission >I. The prognostic impact of AF on in-hospital mortality was examined using multivariate logistic regression model, adjusting for age >65 years, LVEF <40%, and final TIMI flow grade 3. Kaplan-Meier curves for long-term all-cause mortality among the groups were constructed and compared by the log-rank test. Univariate and multivariate Cox proportional hazard analysis were performed to identify hazard ratios (HR) and 95% confidence intervals (CI). All AF categories (Any-AF, AF at admission, AF during hospitalization) were tested in a univariate model and furthermore in a multivariate model adjusted for clinical prognostic factors, including age >65 years, male gender, LVEF <40%, estimated glomerular filtration rate (eGFR) <60ml/min/1.73m^2, anterior MI, peak level of CPK >3000 IU/L, heart rate at admission >100/minutes, and final TIMI flow grade 3. All of the statistical analysis was done with the use of JMP 10.0.2 (SAS Institute Inc, Cary, NC). A p-value<0.05 was considered significant.

Results

Baseline characteristics and relation to AF

The baseline characteristics of the patients are summarized in Table 1.Of the 694 patients, AF was diagnosed in 89 (12.8%, Any-AF group) at admission (38 patients (5.5%)) or during hospitalization (51 patients (7.3%)). Of the 89 patients with AF, AF was terminated spontaneously in 31 (34.8%) patients, by electrical cardioversion in 17 (19.1%), with intravenous or oral administration of amiodarone in 29 (32.6%), with intravenous β-blocker in 7 (10.8%), and was not terminated during index hospitalization in 23 (25.8%). Patients with Any-AF were older, and had a higher heart rate, a lower LVEF, a lower eGFR, a higher prevalence of hypertension, a higher peak level of CPK, a lower rate of final TIMI flow grade 3, and a higher prevalence of previous AF than those without AF. Particularly, patients with AF at admission had a significantly higher heart rate at admission and a higher prevalence of previous AF. Patients with AF during hospitalization had a higher prevalence of hypertension than those without AF. No significant difference was found in sex, body mass index, left atrial dimension, diabetes mellitus, anterior MI, time from symptom onset to presentation, Killip class at admission, past history of MI, stroke, and previous

PCI. Multivariate logistic regression analysis revealed that age >65 years, male gender, heart rate >100/minute, and peak level of CPK >3000 IU/L were independent predictive factors for the prevalence of AF (Table 2).

The medication at discharge is shown in Table 3. Patients with AF were more commonly treated with warfarin and β blockers, but were less received thienopyridine. There were no significant difference in the treatments with ACE-I, ARB and statin between Non-AF and Any- AF. Eighty four (12.7%) patients were treated with aspirin, thienopyridine, and warfarin (triple antithrombotic therapy). Triple antithrombotic therapy was more frequently administered in patients with AF than in non-AF. Neither use of warfarin nor anti-platelet drugs had significant relation to the long-term mortality.

Impact of AF on in-hospital events

CHF, cardiogenic shock, and VT/VF occurred more often in patients with Any-AF than those without AF, and hospitalization was also longer in patients with AF than those without AF. There was no significant difference in the incidence of in-hospital stroke (Table 4). Of the 34 (4.9%) patients who died during index hospitalization, most deaths (91.2%) were due to cardiovascular causes. The unadjusted in-hospital mortality was significantly higher in patients with Any-AF than those without AF (11.2% vs. 4.0%, P=0.009)(Table 4).

However, there was no significant association between AF and in-hospital mortality (odds ratio (OR), 2.31; 95% CI, 0.91-5.47; P=0.076) after adjustment for baseline confounders (Table 5). Furthermore, when stratified by AF subgroups, neither AF at admission nor AF during hospitalization was independent predictors for in-hospital mortality.

Impact of AF on long-term mortality

During a follow-up period of 3.0±1.7 years, a total of 114 (16.4%) patients died. Most deaths (47.4%) were due to cardiovascular causes. The Kaplan-Meier survival curves showed that unadjusted long-term mortality were significantly higher in patients with Any-AF than those without AF (Figure). When comparing the AF subgroups with Non-AF groups, both AF at admission and AF during hospitalization groups had a higher mortality than Non-AF group (Figure). There was no significant difference in long-term mortality between AF at admission and AF during hospitalization groups (Figure).

In the univariate Cox proportional hazard model, the hazard ratio (95% CI) of Any-AF, AF at admission (vs. Non-AF), and AF at hospitalization (vs. Non-AF) were 1.93 (1.19-3.00), 1.96 (0.92-3.69), 1.91 (1.04-3.24), respectively (Table 6). The multivariate analysis by the Cox proportional hazard model revealed that age >65 years (HR, 3.20; 95%CI, 1.97-5.41;

P<0.001), LVEF <40% (HR, 1.76; 95%CI, 1.14-2.72; P=0.012), eGFR <60ml/min/1.73m^2 (HR, 3.76; 95%CI, 2.32-6.41; P<0.001), heart rate at admission >100/minutes (HR, 1.85; 95%CI, 1.10-2.99; P=0.021), and final TIMI flow grade 3 (HR, 0.62; 95%CI, 0.39-0.99; P=0.046) were independent predictors for long-term mortality. However, presenting AF (HR, 1.15; 95%CI, 0.67-1.88; P=0.588) was not significantly associated with long-term mortality (Table 7). Furthermore, when comparing the AF subgroups to Non-AF groups, neither AF at admission (HR, 1.05; 95%CI, 0.45-2.13; P=0.901) nor AF during hospitalization (HR, 1.22; 95%CI, 0.64-2.17; P=0.530) was an independent predictor for long-term mortality (Table 6). When limited to 1-year mortality, patients with AF had a higher mortality rate (18.1% vs. 7.8%, p=0.001 by log-rank test), and presenting AF was an independent predictor (HR, 1.91; 95%CI, 1.03-3.36; p=0.040) for 1-year mortality even after adjustment for age>65 years, male gender, anterior MI, previous MI, and final TIMI flow grade 3.

Discussion

The present study showed that in patients with AMI, presenting AF was associated with higher in-hospital events including all-cause death, CHF, cardiogenic shock, and ventricular arrhythmias. Furthermore, patients with AF

had higher long-term mortality than those without AF. However, multivariate analysis revealed that presenting AF was not an independent predictor for both in-hospital and long-term mortality. When comparing the AF subgroups to non-AF groups, neither AF at admission nor AF during hospitalization was an independent predictor for long-term mortality. To the best of our knowledge, this is the first long-term follow-up report evaluating the prognostic impact of AF in patients with AMI in the PCI era. These findings indicate a significant importance of presenting AF during the acute phase of MI even in the PCI era.

The prevalence of AF in AMI

AF is one of the most common supraventricular arrhythmias in the setting of AMI. In the present study, AF was a common complication of AMI, with a prevalence of 12.8%. It is slightly higher than has been observed in the previous published studies (7% to 10%)[3][4][12]. In the GUSTO I trial [3] which included patients with AMI eligible for thrombolysis, an AF incidence of 10.4% was reported. Wong et al. [4] presented data from GUSTO III study and reported a 7.0% incidence of AF. Eldar et al. [12] reported a 9.8% incidence of paroxysmal AF in patients with AMI. These studies were randomized controlled ones and therefore high risk patients were excluded. Moreover, these studies included only AMI patients with new onset AF or paroxysmal AF. Our study

included AMI patients with not only new onset, transient and paroxysmal AF but persistent and permanent AF.

It has been reported that an old age is found to be the most important independent predictor for AF [3][11][23][24]. In GUSTO I trial, baseline clinical characteristics, including age, heart rate, and Killip class at admission, were found to be significant independent predictors of new AF [3]. We found that patients with AF had worse baseline clinical characteristics including an advanced age, a higher heart rate, a lower LVEF, a lower eGFR, a higher peak level of CPK, and a lower rate of final TIMI flow grade 3 than those without AF. The present study also showed that in addition to male gender, a higher heart rate at admission, a higher peak level of CPK, and history of previous AF, an advanced age was independently associated with the incidence of AF. A retrospective analysis of a registry database which included 106,780 Medicare patients $\geq$65 years of age with AMI showed that the incidence of AF was 22.1% [2]. This high incidence of AF in older patients with AMI is consistent with a generally higher prevalence of AF in elderly individuals as documented by several epidemiological studies [25].

In-hospital events

Being consistent with previous reports [3][12][26], our current study showed that patients with AF suffered significantly more serious in-hospital complications than those without AF. The incidences of CHF, cardiogenic shock, and VT/VF were more frequently observed in patients with AF than in those without AF. In GUSTO trial, patients with AF had a larger infarction size, more extensive coronary artery disease, a poorer reperfusion, and a lower LVEF than those without AF. Similarly, our study showed patients with AF had worse baseline clinical characteristics including an advanced age, a higher heart rate, a lower LVEF, a lower eGFR, a higher peak level of CPK, and a lower rate of final TIMI flow grade 3 than those without AF. Although we could not ascertain the precise etiology of AF, the observation that an increased heart rate and a lower LVEF were associated with AF suggests that hemodynamic compromise is the most likely mechanism.

In this study, in-hospital mortality was significantly higher in patients with AF than in those without AF. An adverse impact of AF on in-hospital mortality in patients with AMI has been reported by several clinical studies [4][14][26]. In these studies, AF was independently associated with in-hospital mortality even after adjustment for multiple confounders [4][14][26]. On the other hand, in some reports, the association of AF with mortality appeared to

be related to CHF, cardiogenic shock, and ventricular arrhythmias, rather than AF itself [11]-[13][24]. In a recent analysis of AMI patients treated with PCI [13], Kinjo et al. showed that in-hospital fatal events occurred more frequently in patients with AF, although after adjustment for possible confounders, including age, gender, DM, hypertension, prior MI, prior cerebrovascular disease, systolic blood pressure <100 mmHg, heart rate ≥100/min., Killip class IV, left anterior descending artery disease, multivessel disease, and final TIMI flow grade 3, AF was not independently associated with in-hospital mortality [13]. In our study, patients with AF had a higher in-hospital mortality in univariate analysis, but presenting AF was not an independent predictor (OR, 2.31; 95%CI, 0.91-5.47; p= 0.076) for in-hospital mortality after adjustment for age>65 years, LVEF<40%, final TIMI flow grade 3. This result is consistent with the report of Kinjo et al [13].

Long-term mortality

Previous studies on the impact of AF on mortality in patients with AMI reported discrepant results, with some studies reporting no adverse effect on long-term mortality [1][10] and others reporting an increased risk of death with AF [2][3][11]-[17]. The present study demonstrates that presenting AF with AMI was associated with long-term mortality but it was not an independent

predictor after adjustment for relevant predictors. Although the Kaplan-Meier curves clearly showed increased mortality in patients with AF regardless of the timing of AF, in multivariate analysis, either AF at admission or AF during hospitalization was not detected as an independent predictor for long-term mortality. In a previous study, patients with AF had more complicated in-hospital clinical course, but AF was not an independent risk factor in in-hospital and long-term mortality after adjustment for baseline characteristics (HR, 1.26; 95% CI, 0.82-1.95; P=0.283) [10]. Goldberg et al. [1] also reported that patients discharged after developing AF had higher long-term death rates than patients who did not develop AF, although these differences were attenuated after adjusting for other factors. Taken together, AF was associated with more complicated clinical course such as CHF or cardiogenic shock, and VT/VF, although there was no significant association between presenting AF and worse long-term mortality after adjustment for relevant predictors. The presence of AF reflects the overall poor clinical status, consequently, might reflect worse prognosis in previous studies. Kinjo et al. showed that patients with AF had significantly greater risk for mortality at 1-year even after adjustment for demographic characteristics and clinical factor [13]. Differences in the inclusion criteria, data adjustment, and follow-up period can at least

partially account for the discrepant results between this previous and the present studies. In our study, when limited to 1-year mortality, patients with AF had a higher mortality rate (18.1% vs. 7.8%, P=0.001 by log-rank test), and presenting AF was an independent predictor (HR, 1.91; 95%CI, 1.03-3.36; p=0.040) for 1-year mortality even after adjustment for age>65 years, male gender, anterior MI, previous MI, and final TIMI flow grade3. This result is consistent with the report of Kinjo et al [13].

Although no significant statistical association was found, AF tended to be associated with higher in-hospital mortality (OR, 2.31; 95%CI, 0.91-5.47; p=0.076). Similarly, AF was an independent predictor for 1-year mortality. Therefore, AF seems to be closely associated with short or mid-term mortality, but not with long-term mortality. In our study, most patients were treated with ACE-I or ARB, β-blocker, and statin. Appropriate treatment including not only early reperfusion therapy but also above drugs may be decreasing prognostic impact of AF in long-term mortality.

Limitation

Our study had several limitations. All analyses were based on the observational data, and the development or termination of AF during the post-discharge periods were not included in our database. The ECG was not

continuously monitored during all periods of hospitalization, and therefore, it might not have captured all of the AF episodes particularly in patients with asymptomatic transient or paroxysmal AF. We categorized patients with a previous history of paroxysmal or transient AF but without recurrence of AF during index hospitalization into Non-AF group, however there might be incorrect categorization of Non-AF group.

Conclusions

Even in the PCI era, AF remains a common and important complication of AMI. Patients with AF were older, were in worse health, and had more complicated clinical events. Patients with AF had higher in-hospital and long-term mortalities, however, the differences were attenuated after adjustment for baseline characteristics. Although the appropriate treatment including early reperfusion therapy may be decreasing prognostic impact of AF in AMI patients, greater attention to the management of AF complicating AMI, particularly among high-risk patients, may be warranted.

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Figure Legends

Figure. Kaplan-Meier curves for unadjusted long-term mortality. Panel A: Kaplan-Meier curves for unadjusted long-term mortalities of patients with atrial fibrillation (Any-AF) and those without it (Non-AF). Panel B: Kaplan-Meier curves for unadjusted long-term mortalities of patients with atrial fibrillation at admission (AF at admission), those who developed atrial fibrillation during hospitalization (AF during hospitalization), and those without it (Non-AF).

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Table 1. Baseline characteristics at presentation

	All (n=694)	Non-AF (n=605, 87.2%)	Any-AF (n=89, 12.8%)	AF at admission (n=38, 5.5%)	AF during hospitalization (n=51, 7.3%)	P value*
Age (years)	66±12	65±13	72±9	72±10†	72±8†	<0.001
Male、n (%)	525 (75.6)	454 (75.0)	71 (79.8)	30 (79.0)	41 (80.4)	0.323
Median follow-up (days)	1095±626	1113±620	978±657	834±627†	1084±664	0.058
Body mass index (kg/m^2)	24.1±3.6	24.2±3.6	23.7±3.5	23.3±3.9	24.0±3.2	0.228
Heart rate at admission (/min.)	78±20	78±19	84±28	91±31†	79±23	0.003
LVEF (%)	46.2±10.3	46.9±9.8	41.9±12.3	41.8±13.7†	42.0±11.2†	<0.001
Left atrial dimension (mm)	36.0±5.7	35.9±5.8	36.5±5.5	34.8±2.5	37.1±6.2	0.616
Diabetes mellitus, n (%)	267 (38.5)	227 (37.5)	40 (44.9)	16 (42.1)	24 (47.1)	0.182
Hypertension, n (%)	465 (67.0)	397 (65.6)	68 (76.4)	26 (68.4)	42 (82.4)†	0.038
eGFR (ml/min/1.73m^2)	59.3±22.7	60.3±22.2	52.8±24.8	52.2±21.6†	53.3±27.1†	0.004
Anterior MI, n (%)	337 (48.6)	297 (49.1)	40 (44.9)	15 (39.5)	25 (49.0)	0.464
Peak CPK (IU/L)	3238±3053	2995±2689	4886±4541	4517±5121†	5160±4087†	<0.001
Final TIMI flow grade3, n (%)	560 (80.7)	496 (82.0)	64 (71.9)	27 (71.1)	37 (72.6)	0.031
Time from symptom onset to presentation, n (%)						
≦6h	455 (65.6)	396 (65.5)	59 (66.3)	27 (71.1)	32 (62.8)	0.091
6-12h	126 (18.2)	108 (17.9)	18 (20.2)	8 (21.1)	10 (19.6)	
12-24h	82 (11.8)	77 (12.7)	5 (5.6)	0 (0.0)	5 (9.8)	
24-48h	31 (4.5)	24 (4.0)	7 (7.9)	3 (7.9)	4 (7.8)	
Killip class at admission, n (%)						
I	557 (80.3)	493 (81.5)	64 (71.9)	30 (79.0)	34 (66.7)	0.236
II	52 (7.5)	42 (6.9)	10 (11.2)	2 (5.3)	8 (15.7)	
III	47 (6.8)	39 (6.5)	8 (9.0)	2 (5.3)	6 (11.8)	
IV	38 (5.5)	31 (5.1)	7 (7.9)	4 (10.5)	3 (5.9)	
History of, n (%)						
Previous AF	16 (2.3)	3 (0.5)	13 (14.6)	11 (29.0)†	2 (3.9)	<0.001
Previous MI	40 (5.8)	37 (6.1)	3 (3.4)	1 (2.6)	2 (3.9)	0.267
Previous stroke	44 (6.3)	42 (6.9)	2 (2.3)	0 (0.0)	2 (3.9)	0.056
Previous PCI	32 (4.6)	29 (4.8)	3 (3.4)	1 (2.6)	2 (3.9)	0.534

* Any-AF vs. Non-AF, †; P<0.05 vs. Non-AF

AF; atrial fibrillation, LVEF; left ventricular ejection fraction, eGFR; estimate glomerular filtration rate, MI; myocardial infarction, CPK; creatine phosphokinase, PCI; percutaneous coronary intervention,

Table 2. Predictors of atrial fibrillation

	OR	95%CI	P value
Age >65 years	3.26	1.94-5.66	<0.001
Male	1.90	1.05-3.60	0.033
Heart rate at admission >100 /min.	6.42	1.86-6.20	<0.001
LVEF <40 %	1.08	0.62-1.84	0.788
Anterior MI	1.43	0.86-2.39	0.171
Peak CPK > 3000 IU/L	1.81	1.08-3.03	0.023
Final TIMI flow grade 3	0.74	0.42-1.34	0.321
Killip class at admission >1	1.61	0.92-2.74	0.094

OR; odds ratio, 95%CI; 95% confidence interval, LVEF; left ventricular ejection fraction, MI; myocardial infarction, CPK; creatine phosphokinase,

Table 3. Baseline treatment at discharge

	All (n=660)	Non-AF (n=581, 88.0%)	Any-AF (n=79, 12.0%)	P value
Aspirin, n (%)	653 (98.9)	575 (99.0)	78 (98.7)	0.853
Thienopyridine, n (%)	622 (94.2)	555 (97.5)	67 (84.8)	<0.001
ACE-I or ARB, n (%)	606 (91.8)	532 (91.6)	74 (93.7)	0.508
β blocker, n (%)	562 (85.2)	488 (84.0)	74 (93.7)	0.013
Statin, n (%)	531 (80.5)	471 (81.1)	60 (76.0)	0.293
Warfarin, n (%)	97 (14.7)	52 (9.0)	45 (57.0)	<0.001
Triple antithrombotic therapy, n (%)	84 (12.7)	46 (7.9)	38 (48.1)	<0.001

AF; atrial fibrillation, ACE-I; angiotensin converting enzyme inhibitor, ARB; angiotensin II receptor blocker, Triple antithrombotic therapy; aspirin, thienopyridine, and warfarin

Table 4. In-hospital events

	All (n=694)	Non-AF (n=605, 87.2%)	Any-AF (n=89, 12.8%)	P value
In-hospital death, n (%)	34 (4.9)	24 (4.0)	10 (11.2)	0.009
CHF, n (%)	136 (19.6)	105 (17.4)	31 (34.8)	<0.001
Cardiogenic shock, n (%)	39 (5.6)	28 (4.6)	11 (12.4)	0.008
VT/VF, n (%)	31 (4.5)	22 (3.6)	9 (10.1)	0.014
Stroke, n (%)	12 (1.7)	9 (1.5)	3 (3.4)	0.250
Hospitalization, days	17±9	17±7	20±15	<0.001

AF; atrial fibrillation, CHF; congestive heart failure, VT; ventricular tachycardia, VF; ventricular fibrillation,

Table 5. Multivariate analysis (In-hospital death)

	OR	95%CI	P value
Any-AF	2.31	0.91-5.47	0.076
Age>65 years	1.85	0.80-4.66	0.156
LVEF<40 %	4.55	2.02-10.91	<0.001
Final TIMI flow grade 3	0.34	0.15-0.78	0.011

OR; odds ratio, 95%CI; 95% confidence interval, AF; atrial fibrillation, LVEF; left ventricular ejection fraction,

Table 6. Hazard ratio of atrial fibrillation for long-term mortality

	Unadjusted HR	95%CI	P value	Adjusted HR*	95%CI	P value
Any-AF	1.93	1.19-3.00	0.009	1.15	0.67-1.88	0.588
AF at admission	1.96	0.92-3.69	0.078	1.05	0.45-2.13	0.901
AF during hospitalization	1.91	1.04-3.24	0.038	1.22	0.64-2.17	0.530

* Adjusted for age>65years, male gender, LVEF<40%, eGFR<60ml/min/1.73m^2, Anterior MI, Perk CPK >3000IU/L, Heart rate at admission >100/min., Final TIMI flow grade 3

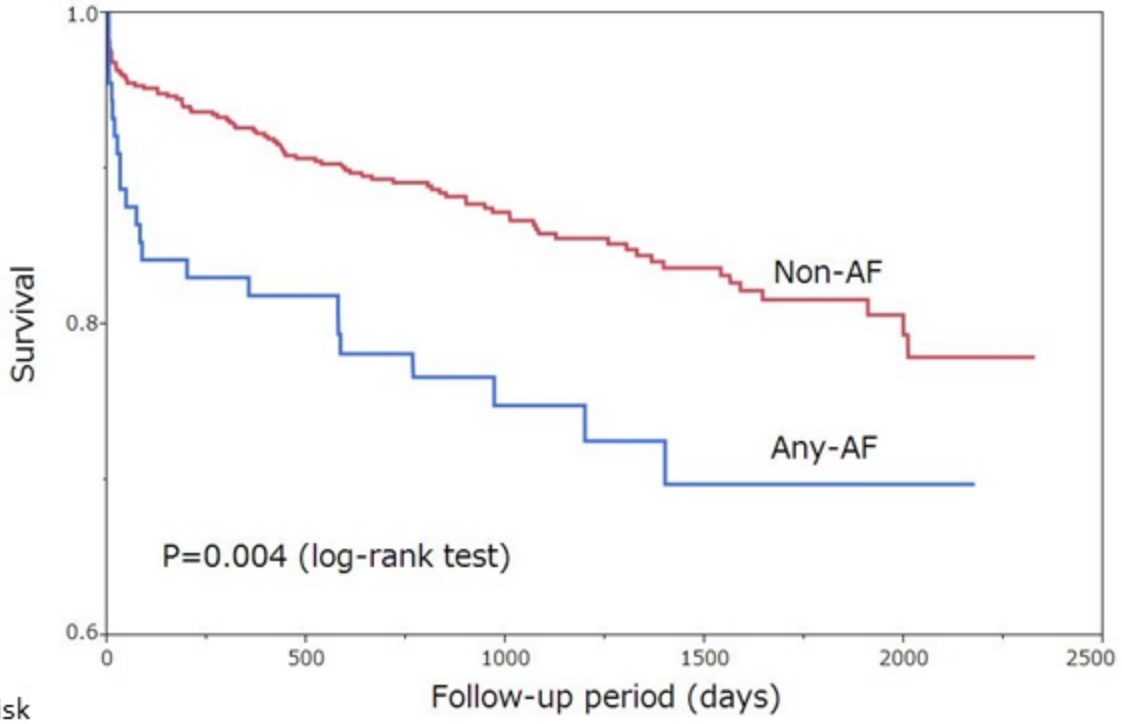
HR; hazard ratio, 95%CI; 95% confidence interval, AF; atrial fibrillation,

Table 7. Cox proportional hazards model for long-term mortality

	HR	95%CI	P value
Any-AF	1.15	0.67-1.88	0.588
Age>65 years	3.20	1.97-5.41	<0.001
Male	0.62	0.37-1.01	0.055
LVEF<40 %	1.76	1.14-2.72	0.012
eGFR<60 ml/min/1.73㎡	3.76	2.32-6.41	<0.001
Anterior MI	1.18	0.48-1.80	0.437
Peak CPK >3000IU/L	1.02	0.66-1.56	0.934
Heart rate at admission >100/min.	1.85	1.10-2.99	0.021
Final TIMI flow grade 3	0.62	0.39-0.99	0.046

HR; hazard ratio, 95%CI; 95% confidence interval, AF; atrial fibrillation, LVEF; left ventricular ejection fraction, eGFR; estimate glomerular filtration rate, MI; myocardial infarction, CPK; creatin phosphokinase,

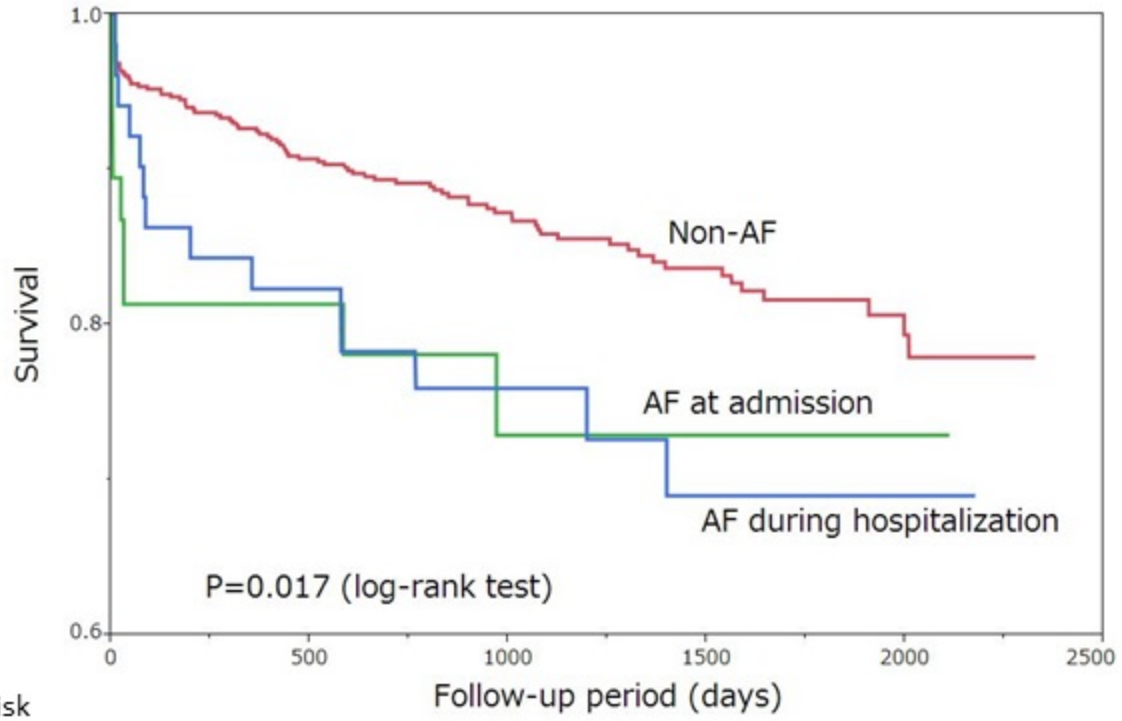
A



No. at risk

Non-AF	497	419	327	247	184	118	63	8
Any-AF	68	55	42	32	22	17	8	

B



No. at risk

Non-AF	497	419	327	247	184	118	63	8
AF at admission	27	20	15	11	7	5	4	
AF during hospitalization	42	36	28	22	16	13	5	