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New-onset atrial fibrillation in patients with acute coronary syndrome may be associated with worse prognosis and future heart failure

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Abstract

Background: The purpose of this study was to evaluate the prognostic value of atrial fibrillation (AF) in patients with acute coronary syndrome (ACS).

Methods: A total 648 of consecutive ACS patients were divided into non-AF and all-AF groups. The all-AF group was further subdivided into new-onset AF and pre-existing AF groups. We compared prognosis among these groups using the Cox regression analysis.

Results: The mean follow-up period was 1.4 ± 1.2 years. Overall patient numbers were 538 in non-AF and 110 in all-AF groups (67 in new-onset AF and 43 in pre-existing AF). Seventy-eight all-cause deaths and 42 cardiac deaths were observed. New-onset AF had a worse prognosis than the other groups in the Kaplan-Meier analysis ($P = 0.025$) after observation. Cox regression analysis indicated no significant difference for all-cause death among the three groups. The hazard ratio of congestive heart failure requiring hospitalization was significantly higher in the all-AF and new-onset AF group than in the non-AF group. Multivariate logistic regression analysis revealed that renal dysfunction, peripheral arterial disease, Killip classification ≥2, and left ventricular ejection fraction (LVEF) were independent predictors of all-cause death. The new-onset AF group had the highest prevalence of Killip classification ≥2 and the lowest LVEF.

Conclusion: In our study, AF was not an independent predictor of all-cause death, but new-onset AF may be associated with worse prognosis and future heart failure.

KEYWORDS
acute coronary syndrome, atrial fibrillation, $CHADS_2$ score, mortality, new-onset atrial fibrillation

1 | INTRODUCTION

Atrial fibrillation (AF) occurs in 6%-21% of patients with acute coronary syndrome (ACS).[1-15] AF causes loss of "atrial kick," tachycardia and irregular rhythm because it decreases cardiac output.[16,17] Therefore, it has been considered that ACS patients with AF have a worse prognosis than patients without AF. Several studies have identified increased mortality attributed to complication of ACS with AF.[1-5,7-9,11-15,18-27] However, there is controversy as to whether AF is an independent predictor.[4,14,22,27]

Thus, it is thought that clinical factors other than AF may determine prognosis. In a number of studies, ACS patients with AF tend to be older than those without AF. There are also reports that such patients have a poor outcome after adjustment for patient clinical characteristics.[3,8,9,11,19-21,24] However, the evidence derived from these studies is quite limited.

Percutaneous coronary intervention (PCI) has become the first line treatment in ACS patients. However, while there have been many reports concerning AF in patients with ACS in the thrombolytic era,[1,3,5,6,18-21,23] there still a small number of such reports in the PCI era.[4,14,22,24,27]

Previous reports have suggested that mortality differed in patients with pre-existing AF or new-onset AF. Some reports directly compared each type of AF,[2,5,6,8,11-15,23,25] and in some of the studies there were indications that new-onset AF worsened the prognosis[2,5,8,11,12,14,15,23]; however, others concluded that new-onset AF did not worsen the prognosis.[6,13,25]

The aim of this study was to evaluate the prognostic value of AF as a complicating factor in patients with ACS, in the current PCI era; comparisons were made among non-AF and all-AF groups, and between non-AF, new-onset AF, and pre-existing AF groups.

2 | METHODS

This study retrospectively included 648 consecutive ACS patients admitted to our institute between December 2008 and December 2012. ACS was defined in accordance with the Third Universal Definition of Myocardial Infarction,[28] incorporating ST-elevated myocardial infarction (STEMI) and non-ST-elevated myocardial infarction (NSTEMI).

This was a retrospective cohort study. Demographics, past medical histories, clinical data, treatment, and major adverse cardiovascular events during in-hospital and follow-up periods, were collected. Coronary angiographic findings were evaluated according to the American Heart Association (AHA) classification.[29] Significant coronary stenosis was defined as ≥75% stenosis of coronary artery by visual estimation. Significant stenosis of left main trunk (LM) was defined as ≥50% occlusion.

Primary end points were defined as all-cause and cardiac deaths. Secondary end points were defined as recurrent myocardial infarction, bleeding event of more than grade three according to the BARC classification,[30] cerebral infarction (CI)/transient

TABLE 1 Baseline clinical characteristics of non-AF and all-AF groups

	Non-AF group (n = 538)	All-AF group (n = 110)	P
Age, years ± SD	66.6 ± 12.5	74.0 ± 9.5	<0.001
Male, n (%)	420 (78.1)	85 (77.3)	0.855
BMI, kg/m² ± SD	24.3 ± 4.0	23.8 ± 3.3	0.233
Hypertension, n (%)	371 (69.0)	85 (77.3)	0.082
Dyslipidemia, n (%)	321 (59.7)	52 (47.2)	0.017
Diabetes mellitus, n (%)	197 (36.6)	46 (41.8)	0.305
Renal dysfunction (eGFR <60 mL/min/1.73 m²), n (%)	163 (30.3)	51 (46.4)	0.001
Current smoker, n (%)	221 (41.1)	20 (18.2)	<0.001
Previous cerebral infarction or TIA, n (%)	53 (9.9)	22 (20.0)	0.003
Previous myocardial infarction, n (%)	56 (10.4)	13 (11.8)	0.690
Previous peripheral artery disease, n (%)	17 (3.2)	10 (9.1)	0.005
STEMI, n (%)	381 (70.8)	68 (61.8)	0.062
Killip's classification ≥2, n (%)	143 (26.6)	56 (50.9)	<0.001
Left ventricular ejection fraction, % (SD)	49.8 (11.0)	47.6 (10.8)	0.053
Multiple vessel disease, n (%)	318 (59.1)	67 (60.9)	0.398
Left main trunk lesion ≥50%, n (%)	45 (8.4)	18 (16.4)	0.006
Emergency PCI, n (%)	436 (81.0)	75 (68.2)	0.001
CABG, n (%)	17 (3.2)	14 (12.7)	<0.001
Emergency PCI or CABG, n (%)	449 (83.5)	89 (80.9)	0.517
In-hospital mortality, n (%)	35 (6.5)	12 (10.9)	0.105

BMI, body mass index; CABG, coronary artery bypass grafting; GFR, glomerular filtration rate; PCI, Percutaneous coronary intervention; STEMI, ST elevation myocardial infarction; TIA, transient ischemic attacks.

ischemic cerebral attack (TIA), and congestive heart failure (CHF) requiring hospitalization. Clinical events were investigated from medical records. Time to outcome event was measured in months from the day of admission.

Patients with AF were divided into two groups: the new-onset and the pre-existing AF groups. New-onset AF was defined as no past history of AF before admission and was observed for the first time during in-hospital stays. Pre-existing AF was defined as previously documented AF before admission, whether paroxysmal or persistent AF. While existence of valvular AF was an exclusion criterion, no such patients were identified during the study period.

Patients were first divided into AF-absent (non-AF) and AF-present (all-AF) groups. Second, study patients were further divided into three groups: non-AF, new-onset AF, and pre-existing AF groups. We compared prognosis among these groups using Cox regression analysis.

2.1 | Statistical analysis

Data are presented as the mean ± SD. Comparison of means was performed using unpaired Student's *t* test and the Mann-Whitney *U* test. Statistical differences in categorical data were explored using the chi-squared test. Survival rates were assessed using the Kaplan-Meier method. The cox proportional hazards regression analysis was used to identify clinical predictors for outcome events. Multivariate logistic regression analysis of significant clinical factors was carried out to identify determinants of prognosis. Factors such as $CHADS_2$ score and emergency PCI or CABG related to multicollinearity were excluded from the analysis. *P*-values less than 0.05 were considered significant. All analyses were performed using SPSS ver. 21.0 statistical software (Chicago, IL, USA).

3 | RESULTS

The mean follow-up period was 1.4 ± 1.2 years and the follow-up rate of this study was 95%. Numbers of non-AF and all-AF patients were 538 and 110, respectively. Numbers of new-onset AF and pre-existing AF patients were 67 and 43, respectively. Patient clinical characteristics are shown in Table 1, and patients were divided into non-AF and all-AF groups. The all-AF group was older and the prevalence of renal dysfunction, history of CI/TIA, peripheral artery disease (PAD), Killip classification ≥2, LM lesion, and CABG procedures was significantly higher than in the non-AF group. There was no significant difference in in-hospital mortality rates between the two groups.

TABLE 2 Baseline clinical characteristics of non-AF, new-onset AF, and pre-existing AF groups

	Non-AF group (n = 538)	New-onset AF group (n = 67)	Pre-existing AF group (n = 43)	P
Age, years ± SD	66.6 ± 12.5	73.0 ± 9.7	75.5 ± 9.2	<0.001
Male, n (%)	420 (78.1)	49 (73.1)	36 (83.7)	0.419
BMI, kg/m^2 ± SD	24.3 ± 4.0	24.1 ± 3.0	23.5 ± 3.7	0.346
Hypertension, n (%)	371 (69.0)	50 (81.4)	35 (81.4)	0.165
Dyslipidemia, n (%)	321 (59.7)	32 (47.8)	20 (46.5)	0.056
Diabetes mellitus, n (%)	197 (36.6)	28 (41.8)	18 (41.9)	0.590
Renal dysfunction (eGFR <60 mL/min/1.73 m^2), n (%)	163 (30.3)	31 (46.3)	20 (46.5)	0.005
Current smoker, n (%)	221 (41.1)	15 (22.4)	5 (11.6)	<0.001
Previous cerebral infarction or TIA, n (%)	53 (9.9)	8 (11.9)	14 (32.6)	<0.001
Previous myocardial infarction, n (%)	56 (10.4)	9 (13.4)	4 (9.3)	0.732
Previous peripheral artery disease, n (%)	17 (3.2)	4 (6.0)	6 (14.0)	0.002
STEMI, n (%)	381 (70.8)	42 (62.7)	26 (60.5)	0.171
Killip's classification ≥2, n (%)	143 (26.6)	40 (59.7)	16 (37.2)	<0.001
Left ventricular ejection fraction, % (SD)	49.8 (11.0)	45.7 (11.0)	50.4 (10.5)	0.013
Multiple vessel disease, n (%)	318 (59.1)	41 (61.2)	26 (60.5)	0.697
Left main trunk lesion ≥50%, n (%)	45 (8.4)	10 (14.9)	8 (18.6)	0.018
Emergency PCI, n (%)	436 (81.0)	42 (62.7)	33 (76.7)	0.001
CABG, n (%)	17 (3.2)	11 (16.4)	3 (7.0)	<0.001
Emergency PCI or CABG, n (%)	449 (83.5)	52 (77.6)	37 (86.0)	0.418
$CHADS_2$ score (SD)	-	2.6 (1.5)	3.2 (1.5)	0.028
In-hospital mortality, n (%)	35 (6.5)	9 (13.4)	3 (7.0)	0.119

BMI, body mass index; CABG, coronary artery bypass grafting; GFR, glomerular filtration rate; PCI, Percutaneous coronary intervention; STEMI, ST elevation myocardial infarction; TIA, transient ischemic attacks.

FIGURE 1 Distribution of CHADS$_2$ scores among the new-onset AF and pre-existing AF groups. The new-onset AF group (blue bar) and pre-existing AF group (orange bar). Distribution of CHADS$_2$ scores was significantly higher in the pre-existing AF group than in the new-onset AF group (P = 0.022)
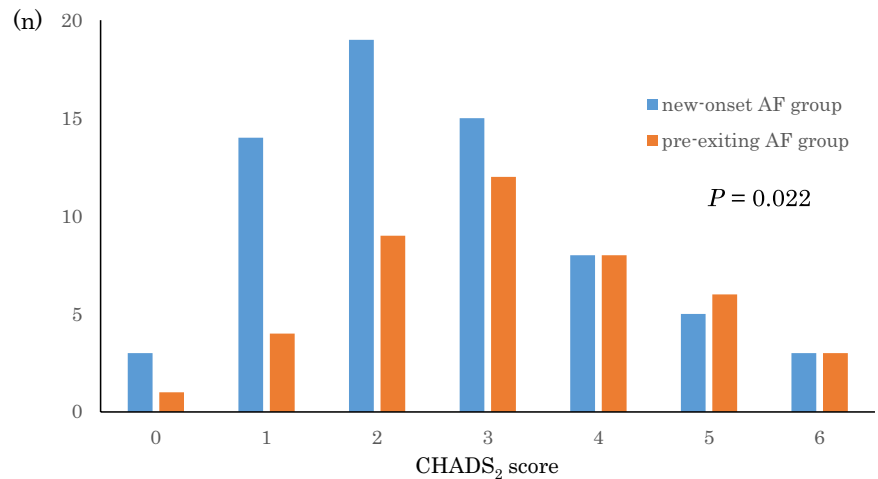
TABLE 3 Primary and secondary end points during follow-up period

	Non-AF group (n = 538)	New-onset AF group (n = 67)	Pre-existing AF group (n = 43)	Total (n = 648)
Primary end point				
All-cause death, n (%)	57 (10.6)	15 (22.4)	6 (14.0)	78 (12.0)
Cardiac death, n (%)	29 (5.4)	10 (14.9)	3 (7.0)	42 (6.5)
Secondary end point				
Myocardial infarction recurrence, n (%)	11 (2.0)	3 (4.4)	0 (0)	14 (2.2)
Cerebral infarction/TIA, n (%)	9 (1.7)	2 (3.0)	3 (7.1)	14 (2.2)
Hemorrhage, n (%)	47 (8.7)	12 (17.9)	4 (9.3)	63 (9.7)
Hospitalization on heart failure, n (%)	12 (2.2)	5 (7.5)	4 (9.3)	21 (3.2)

Follow-up periods; non-AF group 1.3 ± 1.1 year, new-onset AF group 1.5 ± 1.4 year, pre-existing AF group 1.4 ± 1.2 year, P = 0.648.
Hemorrhage: BARC (Bleeding Academic Research Consortium) ≥3.
TIA, transient ischemic attacks.

3.1 | Comparison among the non-AF, new-onset AF, and pre-existing AF groups

Patient clinical characteristics are shown in Table 2 in which patients were divided into three groups: non-AF, new-onset AF, and pre-existing AF groups. There was no significant difference in age between new-onset and pre-existing AF groups. Prevalence of a previous CI/TIA, PAD, and LM lesion was highest in patients with pre-existing AF, but Killip classification ≥2 and CABG procedures were highest in patients with new-onset AF. In addition, LVEF was lowest in the new-onset AF group.

In-hospital mortality rates tended to be higher in the new-onset AF group than in the other groups, but the difference was not significant. CHADS$_2$ score in the pre-existing AF group was significantly higher than in the new-onset AF group (CHADS$_2$ score in the pre-existing AF group was 3.2 ± 1.5, and CHADS$_2$ score in the new-onset AF group was 2.6 ± 1.5, P = 0.028, Table 2). Distribution of CHADS$_2$ scores among patients is shown in Figure 1. Distribution of CHADS$_2$ scores was significantly higher in the pre-existing AF group than in the new-onset AF group (P = 0.022).

During the follow-up period, 78 all-cause deaths and 42 cardiac deaths were confirmed (Table 3).

3.2 | Long-term prognostic differences when comparing two groups or three groups

In a comparison between the non-AF and all-AF groups, all-AF patients had a worse prognosis than the non-AF patients (Log-Rank: P = 0.02) (Figure 2, left). When patients were divided into three groups, the new-onset AF had a worse prognosis than the other groups (Log-Rank: P = 0.025), as illustrated by the Kaplan-Meier curves shown in Figure 2, right. However, long-term mortality was not significantly different on the Cox proportional hazards regression analysis adjusted by age, sex, hypertension, hyperlipidemia, diabetes mellitus, current smoking, and renal dysfunction (Table 4). The hazard ratio of congestive heart failure requiring hospitalization was significantly higher in the all-AF and new-onset AF groups than in the non-AF group. However, there was no significant difference in the pre-existing AF group compared to the non-AF group. Prevalence of
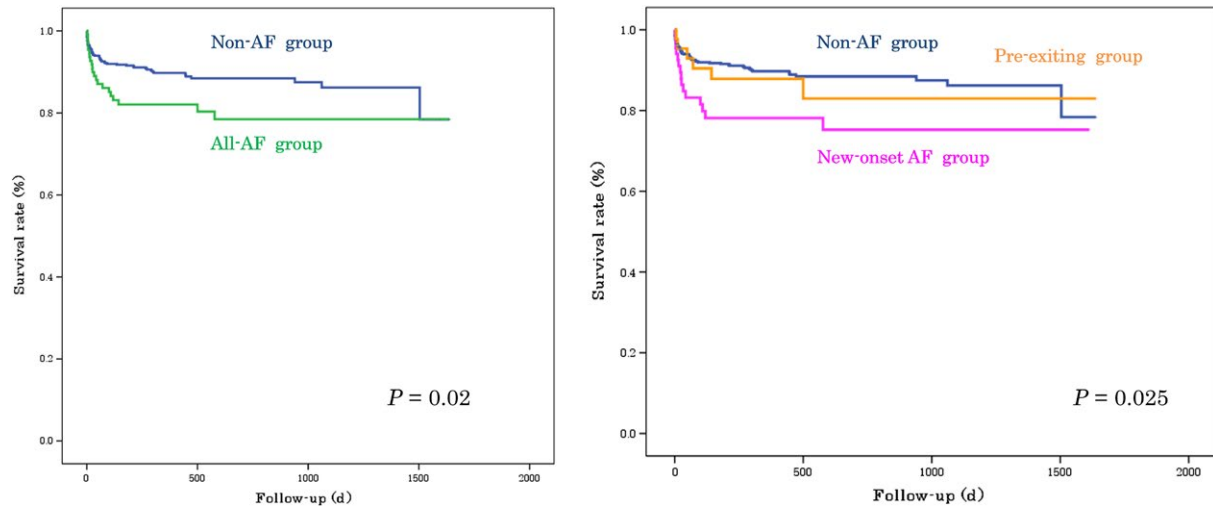
FIGURE 2 Kaplan-Meier analysis of cumulative survival rates for patients with ACS during follow-up period

TABLE 4 Cox-regression analysis

	Non-AF group vs All-AF group		Non-AF group vs New-onset AF group		Non-AF group vs Pre-existing AF group	
	Hazard ratio (95% CI)	*P*	Hazard ratio (95% CI)	*P*	Hazard ratio (95% CI)	*P*
Primary end point						
All-cause death	1.032 (0.605-1.761)	0.908	1.341 (0.742-2.422)	0.331	0.636 (0.265-1.526)	0.310
Cardiac death	1.112 (0.544-2.272)	0.772	1.461 (0.679-3.142)	0.332	0.597 (0.172-2.067)	0.415
Secondary end point						
Myocardial infarction recurrence	1.514 (0.391-5.865)	0.548	2.460 (0.648-9.336)	0.186	0 (0)	0.986
Cerebral infarction/TIA	1.594 (0.515-4.938)	0.419	1.030 (0.216-4.921)	0.970	2.573 (0.643-10.299)	0.182
Hemorrhage	1.460 (0.806-2.646)	0.212	1.894 (0.990-3.622)	0.054	0.835 (0.292-2.390)	0.737
Hospitalization on heart failure	3.352 (1.323-8.492)	0.011	3.801 (1.301-11.103)	0.015	2.825 (0.812-9.830)	0.103

Adjusted by age, sex, hypertension, dyslipidemia, diabetic mellitus, current smoker, renal dysfunction.
TIA, transient ischemic attacks.

TABLE 5 Cox-regression analysis in cases ≥75 or <75 years old

	Non-AF group vs All-AF group		Non-AF group vs New-onset AF group		Non-AF group vs Pre-existing AF group	
	Hazard ratio (95% CI)	*P*	Hazard ratio (95% CI)	*P*	Hazard ratio (95% CI)	*P*
≥75 years old						
Primary end point						
All-cause death	1.253 (0.661-2.376)	0.490	1.792 (0.849-3.786)	0.126	0.820 (0.329-2.042)	0.669
Cardiac death	1.295 (0.560-2.997)	0.546	1.688 (0.668-4.269)	0.269	0.816 (0.225-2.967)	0.758
<75 years old						
Primary end point						
All-cause death	0.673 (0.236-1.923)	0.460	0.958 (0.336-2.732)	0.937	0 (0)	0.973
Cardiac death	0.923 (0.215-3.965)	0.914	1.179 (0.268-5.184)	0.827	0 (0)	0.993

Adjusted by age, sex, hypertension, dyslipidemia, diabetic mellitus, current smoker, renal dysfunction.

TABLE 6 Independent predictors of all-cause death during follow-up period

Candidates variable	Hazard ratio(95% CI)	P
Presence of atrial fibrillation	1.048 (0.521-2.108)	0.896
Age	1.013 (0.981-1.045)	0.442
BMI	0.942 (0.861-1.032)	0.200
Dyslipidemia	0.558 (0.304-1.023)	0.059
Diabetes mellitus	1.506 (0.823-2.755)	0.184
Renal dysfunction	1.971 (1.032-3.761)	0.040
Current smoker	0.682(0.340-1.372)	0.283
Previous cerebral infarction or TIA	1.225 (0.558-2.691)	0.612
Previous peripheral artery disease	2.888 (1.019-8.188)	0.046
Killip's classification ≥2	2.429 (1.246-4.736)	0.009
Left ventricular ejection fraction	0.965 (0.936-0.995)	0.024
Left main trunk lesion ≥50%	1.136 (0.494-2.613)	0.764
Emergency PCI	0.589 (0.292-1.187)	0.139
CABG	1.526 (0.485-4.798)	0.470

BMI, body mass index; TIA, transient ischemic attack; PCI, Percutaneous coronary interventions; CABG, coronary artery bypass grafting.

hemorrhage, CI/TIA, or recurrent myocardial infarction showed no significant differences among the three groups.

Because there were significant differences in age among these groups, we carried out additional Cox proportional hazards regression analysis in cases ≥75 or <75 years of age. There was no significant difference in long-term mortality between the two groups (Table 5). In multivariate logistic regression analysis, AF was not an independent predictor of all-cause death. Significant independent predictors of all-cause death were renal dysfunction, history of PAD, Killip classification ≥2, and LVEF (Table 6).

4 | DISCUSSION

4.1 | Comparison between the non-AF and all-AF groups

In our study, incidence of all-cause death was significantly higher in the all-AF group than in the non-AF group by Kaplan-Meier analysis. However, there was no significant difference between the all-AF and non-AF groups by Cox proportional hazards regression analysis. In multivariate logistic regression analysis, AF was not an independent predictor of all-cause death. Renal dysfunction, history of PAD, Killip classification ≥2, and LVEF remained independent predictors of all-cause death. In the past, studies evaluating predictors of all-cause death reported that lower LVEF or Killip classification, or both, was included in the independent predictor of all-cause death.[3,14,22,26,27] Some reports showed that renal dysfunction was the independent predictor of all-cause death.[14,27] Renal dysfunction, history of PAD, and Killip classification ≥2 were significantly more prevalent in the

all-AF group than in the non-AF group. LVEF tended to be lower in the all-AF group than in the non-AF group. We considered that, in this study, the presence of AF was not an independent predictor for all-cause death, but prevalence of independent predictors was significantly higher in the all-AF group. Therefore, incidence of all-cause death was higher in the all-AF group than in the non-AF group. Previous reports demonstrated that prevalence of chronic kidney disease in patients with AF was significantly higher than in the corresponding non-AF group.[31] This study indicated that advanced age, congestive heart failure, and cardiovascular disease were independent predictors of complications due to AF.

In this study, patients with AF were older and the prevalence of Killip classification ≥2 and renal dysfunction were significantly higher than in patients without AF as previously reported[3,15,22,26] (Table 7). It was notable that these reports found all-cause mortality to be higher in patients with AF than in those without.

4.2 | Comparison among the non-AF group, the new-onset AF group, and the pre-existing AF group

We analyzed the relevance of time of onset of AF. Previous reports concluded that patients with new-onset AF had a worse prognosis[2,5,8,12,14,15,20,21,23,26,27] (Table 7). In this study, Kaplan-Meier analysis demonstrated significant differences for all-cause death in the three groups; in particular, the new-onset AF group showed the poorest outcome. However, in the Cox proportional hazards regression analysis, adjusted for several factors, there were no significant differences in all-cause death among the three groups. Most of the past studies that reported on three or more groups were studied with only Kaplan-Meier analysis[2,13–15,25] (Table 7). Only three reports were studied with Cox proportional hazards regression analysis[5,8,11] (Table 7). Lau et al[8] reported that incidence of all-cause death was significantly higher in the new-onset AF group than in the non-AF group by Kaplan-Meier analysis. However, on the Cox proportional hazards regression analysis, adjusted for several factors, there were no significant differences in all-cause death between the two groups. Incidence of all-cause death in the pre-existing group was still significantly higher than in the non-AF group after adjustment. In this study, Killip classification and LVEF were significant predictors of all-cause death, and prevalence of Killip classification ≥2 was significantly higher and LVEF was lowest in the new-onset AF group. Furthermore, on the Cox proportional hazards regression analysis, prevalence of CHF requiring hospitalization was significantly higher in the new-onset AF group than in the non-AF group. Therefore, we considered that a high prevalence of Killip classification ≥2 and lower LVEF were directly associated with long-term mortality and CHF requiring hospitalization in the new-onset AF group. Strict management during the follow-up period is needed for the ACS patients complicating with new-onset AF.

In this study, we evaluated $CHADS_2$ scores. Among previous studies, none reported $CHADS_2$ score for ACS research-related AF. $CHADS_2$ score and distribution of $CHADS_2$ scores were significantly higher in the pre-existing AF group than in the new-onset AF group. The incidence

TABLE 7 Studies on ACS with AF

Author	Publication date	Number of patients	Follow-up duration	Sub group (mortality %)	Significant difference in prognosis
Comparison of 2 groups					
Crenshaw et al[1]	1997	40 891	1 y	Non-AF (8.4)/AF (21.5)	+
Eldar et al[18]	1998	2866	1 y	Non-AF (15.4)/pAF (38.4)	+
Pedersen et al[3]	1999	6676	5 y	Non-AF (34)/AF (56)	+
Rathore et al[19]	2000	106 780	1 y	Non-AF (32.7)/AF (48.3)	+
Wong et al[20]	2000	13 858	1 y	Non-AF (NR)/new AF (NR)	+
Goldberg et al[21]	2002	2596	5 y	Non-AF (NR)/new AF (NR)	+
Kinjo et al[4]	2003	2475	1 y	Non-AF (7.9)/AF (18.9)	+
Siu et al[6]	2007	431	1 y	Non-AF (5.6)/new AF (6.8)	-
Lopes et al[7]	2008	120 566	1 y	Non-AF (3.3)/AF (10.0)	+
Saczynski et al[9]	2009	7513	5 y	Non-AF (NR)/AF (NR)	+
Lin et al[22]	2011	783	30 d	Non-AF (4.7)/AF (12.9)	+
Beukema et al[24]	2012	1623, 1728	1.3 y	Non-AF (5.0)/AF before PCI (21.0), Non-AF (4.7)/AF after PCI (23.0)	+
Galvao et al[26]	2014	902	0.5 y	Non-AF (5.9)/new AF (13.4)	+
Rene et al[27]	2014	3602	3 y	Non-AF (6.3)/new AF (11.9)	+
Comparison of 3 or more groups					
Sakata et al[2]	1997	1039	8 y	Non-AF (NR)/pre-AF (NR)/new AF (NR)[a]	+
Letho et al[5]	2005	5477	3 y	Non-AF (14.9)/pre-AF (33.0)[a]/new AF (18.0)[a]	+
Lau et al[8]	2009	3393	1 y	Non-AF (NR)/pre-AF (NR)[a]/new AF (NR)	+
Jarbe et al[11]	2011	3220	30 d	Non-AF (NR)/pre-AF (NR)[a]/new AF (NR)[a]	+
Maagh et al[13]	2011	375	2 y	Non-AF (17.8)/cAF (45.5)[a]/new AF (25.0)	+
Poci et al[25]	2012	2335	10 y	Non-AF (36.3)/pre-pAF (69.0)/pre-cAF (78.0)/new AF on admission (68.0)/new AF during admission (53.2)	– (among the subgroup with AF)
Podolecki et al[14]	2012	2980	3.5 y	Non-AF (17.0)/pre-pAF (21.7)/new AF (35.8)[a]/cAF (54.3)[a]	+
Gaca et al[15]	2015	1373	0.5 y	Non-AF (3.6)/pre-AF (10.6)[a]/new-AF (6.3)	+
Systematic review or meta-analysis					
Schimitt et al[10]	2009	NR		NR	NR
Jarbe et al[12]	2011	278 854		Non-AF (NR)/pre-AF (NR)[a]/new AF (NR)[a]	+
Angeil et al[23]	2012	235 511		Non-AF (7.5)/pre-AF (8.3), Non-AF (10.5)/new AF (20.8)[a]	+

Pre-AF, pre-existing AF; new AF, new-onset AF; pAF, paroxysmal AF; cAF, chronic AF; NR, not reported; Y, year(s); D, day(s).
[a]The group that had a significant difference compared with the non-AF group in long-term prognosis.

of the previous cerebral infarction or TIA was significantly higher in the pre-existing AF group than in the new-onset AF group. The results may be due to the higher CHADS2 score in the pre-existing AF group.

4.3 | Study limitations

There were several limitations with this study. First, the number of patients was relatively small, and the study was retrospective in nature. Second, although our definition of AF included persistent and paroxysmal AF, our study did not illustrate these differences. AF type may determine mortality. Finally, the precise period of antiplatelet and anticoagulant drug treatment was unclear because drug prescription

during follow-up was carried out at private outpatient clinics in almost all the cases. In this study, the influence of medication was unclear.

5 | CONCLUSION

In our study, AF was not an independent predictor of all-cause death in ACS patients, but renal dysfunction, history of PAD, and Killip classification ≥2 were independent predictors. Prevalence of these independent predictors was significantly higher in ACS patients complicated with AF. In particular, ACS patients complicating with new-onset AF had a higher prevalence of Killip classification ≥2, lower LVEF, and a significant risk

for CHF requiring hospitalization during the follow-up. Therefore, ACS patients with new-onset AF may have a worse prognosis.

CONFLICT OF INTEREST

Authors declare no conflict of interests for this article.

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