Prognostic Value of Standard Electrocardiographic Parameters for Predicting Major Adverse Cardiac Events after Acute Myocardial Infarction

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Background: The prognostic value of electrocardiographic (ECG) variables in predicting major adverse cardiac events (MACEs) after acute myocardial infarction (AMI) in the era of modern therapy is unclear. This study was conducted to evaluate the prognostic significance of ECG parameters in predicting 1-year MACEs for AMI patients.

Methods: Between January 2006 and January 2008, 529 AMI patients were included. ECG variables were analyzed from the ECG taken on discharge day. The 1-year MACEs were defined as death, nonfatal MI, and revascularization including repeat percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG). Mean follow-up duration was 360 ± 119 days.

Results: Of these patients, 497 (94%) patients provided complete follow-up data (355 males; 67 ± 12 years old). The rate of 1-year MACEs was 16%. In univariate analysis, heart rate, corrected QT interval, left ventricular (LV) hypertrophy, voltage ($SV_1 + RV_5$), lateral ST-depression (V_{5-6} or I, aVL), pathologic Q wave (V_{1-4} , V_{5-6}), ST-elevation (V_{1-4} , V_{5-6} or I, aVL), and T-wave inversion (V_{1-4} , V_{5-6} , or I, aVL) had a significant association with 1-year MACEs. In the Cox regression hazard model, lateral ST-depression (hazard ratio [HR] 2.260, 95% confidence interval [CI] 1.204 to 4.241, $P = 0.011$) and corrected QT interval (HR 1.007, 95% CI 1.002 to 1.011, $P = 0.004$) were independent predictors of 1-year MACEs. After adjustment for all risk variables, lateral ST-depression (HR 3.781, 95% CI 1.047 to 13.656, $P = 0.042$) was the only ECG variable that independently predicted 1-year MACEs.

Conclusion: Lateral ST-depression on discharge day ECG is an independent predictor of 1-year MACEs after AMI.

Ann Noninvasive Electrocardiol 2011;16(1):56–63

electrocardiography; myocardial infarction; prognosis

The electrocardiogram (ECG) is a critical component of the early assessment and risk stratification of patients presenting with acute myocardial infarction (AMI). Previous studies have demonstrated that the admission ECG provides imme-

diately and independent prognostic information; for example, ST-depression on the admission ECG has been associated with poor early and long-term outcomes.^{1–4} In addition, the presence of Q waves after AMI was associated with higher in-hospital

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Conflicts of interest: None.

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morbidity and mortality.^{5,6} Some studies from the prethrombolytic era showed that a prolonged QTc interval predicted cardiac events after AMI.^{7,8} However, studies performed during the thrombolytic era showed lateral ST-depression and atrial abnormality as important prognostic factors after AMI,⁹ suggesting changing prognostic factors according to changing treatment modality. Recently, aggressive medical therapy, primary percutaneous coronary intervention (PCI), and early aggressive intervention have increased in patients with AMI and have become the predominant mode of reperfusion in patients with AMI. In the era of modern therapy, ST-depression on admission ECG had a significant prognostic value even after considering independent factors such as expanded biomarker profiles in the GUSTO-IV (Global Utilization of Strategies to Open Occluded Arteries-IV) trial.¹⁰ However, not much is known about the prognostic significance of the discharge day ECG. In addition, comprehensive information about the independent value of different ECG variables in predicting major adverse cardiac events (MACEs) after AMI in the era of modern therapy is also limited. Therefore, this study assessed the prognostic significance of different ECG parameters in predicting MACEs during follow-up of patients with AMI.

METHODS

Patients

Targeted were a total of 549 patients with an AMI who had visited Kyungpook National University Hospital between January 2006 and January 2008. We excluded 20 patients who expired during hospitalization and 32 patients with incomplete data, and thus, 497 (94.0%) patients (67 ± 12 years old, 335 males) were finally included. The diagnosis of the index AMI was confirmed by symptoms, ECG changes, and cardiac troponin I >0.10 ng/mL. The index AMI could be either a first or recurrent infarction.

Primary PCI and early invasive PCI are the primary modes of therapy at Kyungpook National University Hospital for patients with ST-segment elevation MI (STEMI) and non ST-segment elevation MI (NSTEMI), respectively. Primary PCI for patients with STEMI is also a highly recommended mode of reperfusion therapy by the Korean government.

Data Acquisition and End Point Data

The clinical variables included demographic characteristics, medical history, and course in the coronary care unit. Patients were followed up for 360 ± 119 days. The end point of the present study was the completion of 1-year follow-up without MACEs or development of MACEs during follow-up, whichever occurred first. The 1-year MACEs were defined as death, nonfatal MI, revascularization including repeated PCI, or coronary artery bypass grafting (CABG). End point events were reviewed by 2 cardiologists using relevant medical records.

ECG Variables

All the ECG parameters were analyzed from a standard 12-lead ECG that was obtained on discharge day. The PQRS intervals and abnormalities were determined according to prespecified criteria. The QT interval was measured from the beginning of the QRS complex to the end of the T wave primarily from the limb lead II. The Bazett's formula was used to obtain heart rate-corrected QT values (QTc). The PR interval was measured from the beginning of the P wave to the beginning of the QRS complex. ECG abnormalities were defined according to the guidelines of ECG classification for post infarction clinical trials.^{11,12} ST-depression was defined as ST-depression ≥ 1.0 mm, 80 ms beyond the J point. ST-elevation was defined as ST-elevation of ≥ 1.0 mm in limb leads or ≥ 2.0 mm in precordial leads. The atrial abnormality was defined as a terminal deflection of the P wave at least 0.1 mV deep and 40 ms in duration in lead V₁. The left bundle branch block and right bundle branch block were determined according to the usually accepted morphologic changes with the prolonged QRS width of ≥ 120 ms. The diagnosis of left ventricular (LV) hypertrophy required voltage for S in lead V₁ plus R in lead V₅ to be ≥ 35 mm and ST and T-wave strain patterns in the lateral precordial leads. Q waves were classified as pathologic if their duration was ≥ 40 ms.

Statistical Analysis

All comparisons of the baseline variables were assessed with the chi-square test for categorical variables and Student's *t*-test for continuous variables. The Cox proportional hazards model was used to assess the time-dependent association of

cardiac events with variables that were significantly ($P < 0.05$) associated with cardiac events in univariate comparisons. Kaplan-Meier cumulative probabilities for the 1-year MACEs were computed for ECG risk markers that independently predicted cardiac events in the Cox hazards model. A multivariate logistic regression model was used to estimate the independence of associations between the ECG variables that independently predicted cardiac events in the Cox model and other risk variables. A P value < 0.05 was considered statistically significant. The statistical analyses were performed using SPSS version 15.0 for Windows (SPSS Inc., Chicago, IL).

RESULTS

Clinical Characteristics

Clinical characteristics of the patients after AMI with and without 1-year MACEs during follow-up are listed in Table 1. Patients were composed of

207 (41.6%) patients with STEMI and 290 (58.4%) patients with NSTEMI. One hundred forty (67.6%) of STEMI patients and 194 (66.9%) of NSTEMI patients were treated with primary PCI and early invasive PCI, respectively (Table 1). During a mean follow-up of 360 ± 119 days, 46 (9.3%) patients died, 18 (3.6%) patients experienced another non-fatal myocardial infarction, 16 (3.2%) patients received repeated PCI, and 6 (1.2%) patients received CABG.

Univariate Predictors of 1-year MACEs

Several baseline clinical characteristics and ECG variables differed between patients with and without MACEs during follow-up (Tables 1 and 2). Body mass index (22.6 ± 3.2 Kg/m² vs 24.1 ± 3.2 Kg/m², $P < 0.001$), diabetes mellitus (41.9% vs 29.4%, $P = 0.022$), Killip class >1 (46.5% vs 23.6%, $P < 0.001$), serum creatinine (1.9 ± 1.9 mg/dL vs 1.1 ± 1.1 mg/dL, $P < 0.001$), triglyceride (124.3 ± 72.6 mg/dL vs 146.3 ± 116.0 mg/dL,

Table 1. Comparison of Clinical Characteristics between Patients with and without Major Adverse Cardiac Events

	Total (n = 497)	MACE (–) (n = 411)	MACE (+) (n = 86)	P Value
Age > 65 (%)	302 (60.8)	243 (59.1)	59 (68.6)	0.102
Male (%)	335 (67.4)	281 (68.4)	54 (62.8)	0.315
Body mass index (kg/m ²)	23.9 ± 3.0	24.1 ± 3.2	22.6 ± 3.2	<0.001
Previous IHD (%)	118 (23.7)	92 (22.4)	26 (30.2)	0.126
Hypertension (%)	246 (49.5)	204 (49.6)	42 (48.8)	0.893
Diabetes mellitus (%)	157 (31.6)	121 (29.4)	36 (41.9)	0.022
Hyperlipidemia (%)	91 (18.3)	78 (19.0)	13 (15.1)	0.334
Current smoker (%)	199 (40.0)	168 (40.9)	31 (36.0)	0.387
Killip class >1 (%)	137 (27.6)	97 (23.6)	40 (46.5)	<0.001
LVEF (%)	52.6 ± 11.0	53.8 ± 10.0	45.8 ± 13.5	<0.001
PCI (%)	364 (73.2)	310 (75.4)	36 (41.9)	<0.001
Stenting (%)	320 (64.4)	293 (71.3)	27 (31.4)	<0.001
STEMI (%)	207 (41.6)	180 (43.8)	27 (31.4)	0.034
Primary PCI	140 (67.6)	124 (68.9)	16 (59.3)	0.066
Thrombolytics	22 (10.6)	22 (12.2)	0 (0.0)	
Conservative	45 (21.7)	34 (18.9)	11 (40.7)	
NSTEMI	290 (58.4)	231 (56.2)	59 (68.6)	0.034
Early invasive*	194 (66.9)	161 (69.7)	33 (55.9)	0.040
Conservative	96 (33.1)	70 (30.3)	26 (44.1)	
Hemoglobin (g/dL)	13.3 ± 2.1	13.5 ± 1.9	12.4 ± 2.5	<0.001
Serum creatinine (mg/dL)	1.2 ± 1.3	1.1 ± 1.1	1.9 ± 1.9	<0.001
Triglyceride (mg/dL)	141.0 ± 108.5	146.3 ± 116.0	124.3 ± 72.6	0.031
NT-proBNP (pg/mL)	$3609.4 \pm 8,370.8$	$2388.4 \pm 5,870.9$	$9308.9 \pm 11,688.7$	<0.001

Abbreviations as in text: MACE = major adverse cardiac event; IHD = ischemic heart disease; LVEF = left ventricular ejection fraction; PCI = percutaneous coronary intervention; STEMI = ST-segment elevation MI; NSTEMI = non ST-segment elevation MI, NT-proBNP = N-terminal probrain natriuretic peptide.

*performed coronary angiography before 48 hours after diagnosis of NSTEMI in case of NSTEMI. Revascularization was performed on the basis of coronary anatomical findings.

Table 2. ECG Variables of Study Patients and Univariate Analysis of 1-Year Major Adverse Cardiac Events

	Total (n = 497)	MACE (–) (n = 411)	MACE (+) (n = 86)	P Value
Heart rate (/min)	73.5 ± 16.2	72.9 ± 15.2	77.4 ± 19.3	0.047
QRS interval (ms)	93.2 ± 20.0	92.9 ± 20.2	96.7 ± 21.7	0.175
QTc interval (ms)	436.9 ± 46.8	433.2 ± 43.0	454.3 ± 63.0	<0.001
PR interval (ms)	171.7 ± 27.1	171.7 ± 26.2	174.3 ± 26.3	0.423
Voltage (SV ₁ + RV ₅) (ms)	22.4 ± 11.3	21.8 ± 11.0	24.5 ± 12.4	0.046
LV hypertrophy (%)	75 (15.1)	55 (13.4)	20 (23.3)	0.020
Atrial fibrillation (%)	20 (4.0)	14 (3.4)	6 (7.0)	0.125
Atrial abnormality (%)	81 (16.3)	62 (15.1)	19 (22.1)	0.110
LBBB (%)	7 (1.4)	4 (1.0)	3 (3.5)	0.072
RBBB (%)	23 (4.6)	17 (4.1)	6 (7.0)	0.254
Pathologic Q wave				
V _{1–4} (%)	104 (20.9)	76 (18.5)	28 (32.6)	0.004
V _{5–6} (%)	25 (5.0)	15 (3.6)	10 (11.6)	0.002
I, aVL (%)	13 (2.6)	9 (2.2)	4 (4.7)	0.186
II, III, aVF (%)	171 (34.4)	148 (36.0)	23 (26.7)	0.100
ST-elevation				
V _{1–4} (%)	91 (18.3)	68 (16.5)	23 (26.7)	0.026
V _{5–6} or I, aVL (%)	19 (3.8)	12 (2.9)	7 (8.1)	0.022
II, III, aVF (%)	27 (5.4)	21 (5.1)	6 (7.0)	0.487
ST-depression				
V _{1–4} (%)	22 (4.4)	16 (3.9)	6 (7.0)	0.206
V _{5–6} or I, aVL (%)	45 (9.1)	26 (6.3)	19 (22.1)	<0.001
II, III, aVF (%)	18 (3.6)	12 (2.9)	6 (7.0)	0.067
T-wave inversion				
V _{1–4} (%)	150 (30.2)	112 (27.3)	38 (44.2)	0.002
V _{5–6} (%)	163 (32.8)	123 (29.9)	40 (46.5)	0.003
I, aVL (%)	96 (19.3)	71 (17.3)	25 (29.1)	0.012
II, III, aVF (%)	159 (32.0)	134 (32.6)	25 (29.1)	0.523

Abbreviations as in text: MACE = major adverse cardiac event; LV = left ventricular; LBBB = left bundle branch block; RBBB = right bundle branch block.

P = 0.031), hemoglobin (12.4 ± 2.5 g/dL vs 13.5 ± 1.9 g/dL, $P < 0.001$), and N-terminal probrain natriuretic peptide (NT-proBNP) ($9308.9 \pm 11,688.7$ pg/mL vs 2388.4 ± 5870.9 pg/mL, $P < 0.001$) were different between patients with and without MACEs (Table 1). Patients with MACEs presented more often as NSTEMI (68.6% vs 56.2%, $P = 0.034$), had less early invasive treatment (55.9% vs 69.7%, $P = 0.04$). Both PCI (41.9% vs 75.4%, $P < 0.001$) and stenting (31.4% vs 71.3%, $P < 0.001$) were less frequent in patients with 1-year MACEs (Table 1). Heart rate, QTc interval, LVH, voltage (SV₁ + RV₅), lateral ST-depression (V_{5–6} or I, aVL), pathologic Q wave (V_{1–4}, V_{5–6}), ST-elevation (V_{1–4}, V_{5–6} or I, aVL), and T-wave inversion (V_{1–4}, V_{5–6}, I, aVL) were the only ECG variables with significant univariate association involving 1-year MACEs (Table 2).

Predictors of 1-year MACEs after Adjustment for All Risk Variables

In multivariate logistic regression analysis, lateral ST-depression (hazard ratio [HR] 2.260, 95% confidence interval [CI] 1.204 to 4.241, $P = 0.011$) and QTc interval (HR 1.007, 95% CI 1.002 to 1.011, $P = 0.004$) were independent predictors of 1-year MACEs after adjusting ECG variables (Table 3). After adjustment for clinical and ECG variables, lateral ST-depression (HR 3.781, 95% CI 1.047 to 13.656, $P = 0.042$) was the only ECG variable that independently predicted 1-year MACEs and QTc interval (HR 1.006 95% CI 0.994 to 1.018, $P = 0.325$) was no longer significant (Table 3). Cumulative probabilities of MACEs in patients with and without lateral ST-depression are shown in Figure 1.

Table 3. Multivariate Logistic Regression Analysis for Independent Predictors of 1-Year Major Adverse Cardiac Events

	Adjusted for ECG Variables			Adjusted for All Risk Variables*		
	HR	95% CI	P Value	HR	95% CI	P Value
Heart rate	1.013	0.999–1.027	0.079	0.985	0.951–1.021	0.410
QTc interval	1.007	1.002 – 1.011	0.004	1.006	0.994–1.018	0.325
LV hypertrophy	1.729	0.950–3.147	0.073	1.284	0.381–4.326	0.687
Pathologic Q wave						
V _{1–4}	1.292	0.732–2.282	0.377	0.887	0.287–2.741	0.835
V _{5–6}	1.972	0.921–4.225	0.080	0.934	0.115–7.566	0.949
ST-elevation						
V _{1–4}	1.136	0.627–2.057	0.674	1.209	0.270–5.408	0.804
V _{5–6} or I, aVL	1.657	0.639–4.292	0.299	2.731	0.348–21.445	0.339
ST-depression						
V _{5–6} or I, aVL	2.260	1.204–4.241	0.011	3.781	1.047–13.656	0.042
T-wave inversion						
V _{1–4}	1.394	0.815–2.382	0.225	1.615	0.498–5.244	0.425
V _{5–6}	0.951	0.548–1.651	0.858	1.025	0.304–3.457	0.968
I, aVL	1.184	0.673–2.083	0.558	0.556	0.152–2.043	0.377

Abbreviations as in text: HR = hazard ratio; CI = confidence interval.

*Adjusted for age >65, body mass index, diabetes mellitus, Killip class >1, percutaneous coronary intervention, hemoglobin, serum creatinine, triglyceride, and NT-proBNP levels. LV = left ventricular.

Predictors of Lateral ST-Depression

Risk variables that showed a significant association with any of the MACEs were compared

between patients with and without lateral ST-depression (Table 4). Our data showed a univariate association between lateral ST-depression and clinical parameters, including age of >65 (75.6% vs

Figure 1. Cumulative probability of 1-year MACE in patients with and without lateral ST-segment depression.

Table 4. Baseline Characteristics of Patients Associated with Lateral ST-Depression.

	Lateral ST-Depression		P Value
	Yes (n = 45)	No (n = 452)	
Age > 65 (%)	34 (75.6)	269 (59.5)	0.035
Male (%)	29 (64.4)	309 (68.4)	0.591
Previous IHD (%)	22 (48.9)	93 (20.6)	<0.001
Hypertension (%)	28 (62.2)	219 (48.5)	0.078
Diabetes mellitus (%)	18 (40.0)	140 (31.0)	0.231
Hyperlipidemia (%)	9 (20.0)	83 (18.4)	0.780
Current smoker (%)	16 (35.6)	187 (41.4)	0.512
PCI (%)	26 (57.8)	323 (71.5)	0.056
Killip class >1 (%)	22 (48.9)	112 (24.8)	0.001
LVEF < 40%	8 (17.8)	46 (10.2)	0.066
STEMI (%)	13 (28.9)	190 (42.0)	0.087
Systolic blood pressure (mmHg)	145.2 ± 30.2	136.5 ± 26.8	0.046
Heart rate (/min)	78.8 ± 22.4	78.6 ± 36.5	0.965
Hemoglobin (g/dL)	12.5 ± 2.0	13.4 ± 2.0	0.004
Serum creatinine (mg/dL)	1.6 ± 1.5	1.1 ± 1.2	0.075
cTnI (ng/mL)	33.3 ± 61.9	33.6 ± 74.6	0.983
Total cholesterol (mg/dL)	177.3 ± 59.3	175.9 ± 42.6	0.858
Triglyceride (mg/dL)	133.4 ± 78.8	143.6 ± 113.3	0.577
HDL-cholesterol (mg/dL)	46.6 ± 11.7	44.8 ± 12.1	0.389
LDL-cholesterol (mg/dL)	118.1 ± 50.9	117.5 ± 38.6	0.926

Abbreviations as in text: IHD = ischemic heart disease; PCI = percutaneous coronary intervention; LVEF = left ventricular ejection fraction; STEMI = ST-segment elevation myocardial infarction; cTnI = cardiac troponin I.

59.5%, $P = 0.035$), Killip class >1 (48.9% vs 24.8%, $P = 0.001$), history of ischemic heart disease (48.9% vs 20.6%, $P < 0.001$), higher systolic blood pressure (145.2 ± 30.2 mmHg vs 136.5 ± 26.8 mmHg, $P = 0.046$), and lower hemoglobin level (12.5 ± 2.0 g/dL vs 13.4 ± 2.0 g/dL, $P = 0.004$) (Table 4). The proportion of patients with LV dysfunction (LV ejection fraction <40%) (17.8% vs 10.2%, $P = 0.066$) and with PCI (57.8% vs 71.5%, $P = 0.056$) were marginally different between the two groups (Table 4).

The independence of the observed univariate associations were estimated in the multivariate logistic regression analysis model by using the risk variables as covariates. In this model, the history of ischemic heart disease (odds ratio [OR] 2.946 95% CI 1.498 to 5.793, $P = 0.002$) showed a significant independent association with lateral ST-segment depression (Table 5).

DISCUSSION

In this study, we assessed the prognostic value of ECG findings from the discharge 12-lead routine ECG in patients with AMI to establish whether it still provides some additional prognostic infor-

mation to the known clinical characteristics and other risk factors even in the era of modern aggressive interventional therapy. Previous studies have demonstrated the association between ST-depression, QTc interval prolongation, pathologic Q wave, and atrial abnormality on a standard ECG and increased mortality after AMI.¹⁻⁹ In multivariate analysis restricted to ECG variables, our observations found that lateral ST-depression and QTc interval were independent predictors of increased 1-year MACEs. After adjustment for all other risk variables, such as age, body mass index, diabetes mellitus, Killip class, PCI, hemoglobin, serum creatinine, triglyceride, and NT-proBNP levels, lateral ST-depression was the only ECG variable that independently predicted 1-year MACEs. The QTc interval prolongation, atrial abnormality, pathologic Q wave, and heart rate were not independently associated with MACEs.

Some earlier studies also have shown that ST-depression on the standard ECG is associated with adverse short- and long-term outcomes.¹⁰⁻¹⁴ ST-depression in precordial leads has been associated with a larger infarction, worse-wall motion abnormalities, lower ejection fraction, and a higher rate of short- and long-term complications and

Table 5. Multivariate Logistic Regression Analysis for Independent Predictors of Lateral ST-Depression

	OR	95% CI	P Value
Age >65	1.544	0.679–3.508	0.300
Killip class > 1	1.787	0.877–3.641	0.110
Previous IHD	2.946	1.498–5.793	0.002
Hemoglobin	0.905	0.760–1.078	0.263
Systolic blood pressure (mmHg)	1.009	0.997–1.020	0.143

Abbreviations as in text: OR = odds ratio; CI = confidence interval; IHD = ischemic heart disease.

mortality.^{14–17} In this study, patients with lateral ST-depression were the worst in overall risk factor profile; they were older and had a higher Killip class, more history of ischemic heart disease, higher systolic blood pressure, lower hemoglobin level, lower LV ejection fraction, and underwent fewer PCI. These findings may reflect the higher incidence of severe coronary artery disease and poorer health conditions of those patients.

One previous study already showed poorer outcome in AMI patients with lateral ST-depression compared with those who had antero-septal ST-depression.¹⁸ In case of inferior STEMI, ST-depression in leads I and aVL is a common finding and represents reciprocal changes to the inferior wall ischemia without prognostic implications. ST-depression in aVL may even precede ST-elevation in the inferior leads in some patients.¹⁹ However, studies of concomitant ST-depression in patients with inferior wall STEMI^{18,20,21} have shown that ST-depression in leads V₄ to V₆ was associated with higher mortality^{18,20} and higher rates of left anterior descending and/or multivessel coronary artery disease.^{21,22} In patients with NSTEMI, the study by Barrabés et al.²³ showed that ST-depression in ≥ 2 lateral leads was associated with lower LV ejection fraction, left main coronary artery, or 3-vessel disease more often than in patients without lateral ST-depression. In addition, persistence of ST-depression in precordial leads over 24 hours after admission despite intensive medical treatment has been reported to signify a higher 1-year mortality rate.^{11,24,25} Such patients have higher incidence of severe stenosis, visible thrombus, and complex culprit lesion on coronary arteries.²⁵ ST-depression may reflect the severity of coronary artery disease, the degree of LV dysfunction, and reversible ischemia.^{12,23,25} In this study, ST-depression only in lateral, but not in other locations, was associated with 1-year MACEs. It may be that the ST-segment

in lateral leads is more sensitive not only to ischemia and myocardial changes, but also to the other above-mentioned risk factors than the ST-segment in other leads.

As almost two-thirds of our STEMI and NSTEMI patients were treated with primary PCI and early invasive strategy, respectively, we think that our data may represent the real world situation. The routine ECG still provided some additional prognostic information in AMI patients even in the era of modern aggressive interventional therapy.

Our study had some limitations that should be considered. First, the retrospective nature of this analysis and the small sample size are major limitations of this study. Second, because the study was conducted in a single-institution setting, selection bias may be inevitable. Finally, our study did not analyze the coronary angiography or PCI findings of the patients. Coronary angiography and PCI findings of patients with lateral ST-depression would clarify the relationship between lateral ST-depression and poorer prognosis during follow-up. Further study including a larger number of patients, multiinstitution setting, and coronary angiographic, and PCI findings are required to clarify and revalidate our findings.

We conclude that the discharge ECG can provide important prognostic information on postinfarction patients even in the era of modern therapy. ST-depression in lateral leads was an important prognostic factor of 1-year MACEs in patients with AMI. Thus, more diligent treatment and follow-up are needed in AMI patients with lateral ST-depression.

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