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New Horizons of Acute Myocardial Infarction: From the Korea Acute Myocardial Infarction Registry

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As the first nationwide Korean prospective multicenter data collection registry, the Korea Acute Myocardial Infarction Registry (KAMIR) launched in November 2005. Through a number of innovative approaches, KAMIR suggested new horizons about acute myocardial infarction (AMI) which contains unique features of Asian patients from baseline characteristics to treatment strategy. Obesity paradox was existed in Korean AMI patients, whereas no gender differences among them. KAMIR score suggested new risk stratifying method with increased convenience and an enhanced accuracy for the prediction of adverse outcomes. Standard loading dose of clopidogrel was enough for Asian AMI patients. Triple antiplatelet therapy with aspirin, clopidogrel and cilostazol could improve clinical outcomes than dual antiplatelet therapy with aspirin and clopidogrel. Statin improved clinical outcomes even in AMI patients with very low LDL-C levels. The rate of percutaneous coronary intervention was higher and door-to-balloon time was shorter than the previous reports. Zotarolimus eluting stents as the 2nd generation drug-eluting stent (DES) was not superior to the 1st generation DES, in contrast to the western AMI studies. KAMIR made a cornerstone in the study of Korean AMI and expected to be new standards of care for AMI with the renewal of KAMIR design to overcome its pitfalls.

Key Words: Acute Myocardial Infarction; ST-Elevation Myocardial Infarction; Non-ST-Elevation Myocardial Infarction

INTRODUCTION

As the first nationwide Korean prospective multicenter data collection registry, the Korea Acute Myocardial Infarction Registry (KAMIR) launched in November 2005, reflecting real-world treatment practices and outcomes in Asian patients diagnosed with acute myocardial infarction (AMI). The registry includes 52 community and teaching hospitals with facilities for primary percutaneous coronary intervention (PCI) and on-site cardiac surgery. Comprehensive review of extensive body of reports including large scale randomized clinical trials and meta-analysis made the basement of KAMIR design. After pilot study, Steering Committee of KAMIR revised the initial design, and KAMIR began to enroll patients formally. Data were collected by a trained study coordinator at each participating intsitution using a standarized case report form and protocol. Standardized definitions of all patient-related variables, procedure-related variables, and clinical outcome-related variables were used. Standardized definitions of all variables were instituited by the Steering Commitee Board of KAMIR. Data were registered and submitted from individual institutions via password-protected Internet-based electronic case report forms. The Steering Commitee of KAMIR authorized a core study laboratory only permitted to the principal study coordinators and sub-task (division) principal investigators. From November 2005 to January 2008, the registry enrolled 14,885 patients. The success of the KAMIR led to the establishment of the Korea Working Group on Myocardial Infarction (KorMI), a subsequent study of the KAMIR, which is an ongoing open-ended registry that captures data on the complete spectrum of patients with AMI including long-term clinical follow-up. The KorMI plus KAMIR includes 40,254 patients as of July 2012. The present article decribes current status of AMI based on analyses of the KAMIR.

Ethics statements

The study was conducted according to the Declaration of Helsinki. The institutional review board of all paticipating centers approved the study protocol. The approval number was I-2008--1-009 of Chonnam National University Hospital. Written informed consent was obtained from all participating patients.

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RISK FACTORS AND CLINICAL OUTCOMES OF AMI

Well known risk factors for coronary heart disease were also highly distributed in Korean AMI patients as well as other registries (Table 1) (1-5). However, KAMIR and the Heart Institute of Japan Acute Myocardial Infarction (HIJAMI) registry (5) showed higher prevalence of diabetes mellitus and less body mass index (BMI) compared with western AMI registries (1-4).

Diabetes mellitus

Despite higher prevalence of diabetes mellitus in Korean AMI patients, KAMIR showed worse clinical outcomes among them similar to the previous studies (1, 6). Analysis using KAMIR data showed that hypertensive AMI patients accompanied with diabetes were associated with worse clinical and angiographic features, with a higher risk of development of severe heart failure, and an increased risk of in-hospital mortality and 1 yr adverse cardiac events (7). Furthermore, when diabetic AMI patients accompanied with renal insufficiency, 1-yr mortality were increased compared with those without diabetes nor renal insufficiency (adjusted hazard ratio [HR] 2.42, 95% confidence interval [CI] 1.62-3.62) (8). With regard to clinical outcomes after 1st generation drug eluting stents (DES), KAMIR analysis showed interesting results (9). Diabetes itself has been regarded as the risk factor for in-stent restenosis, which might contribute the increased overall major adverse cardiac events (MACEs). Also, many studies showed that the patients with paclitaxel-eluting stents (PES) had an increased risk for repeated revascularization compared with the patients with sirolimus-eluting stents (SES) (10-12). In the overall population, 1 yr MACE rate was significantly higher in the PES than the SES group (11.6% vs 8.6%, $P = 0.014$), which was mainly due to increased target lesion revascularization (TLR). In diabetic subgroup, the MACE rates were not different between the patients with PES and the patients with SES, in contrast to the nondiabetic subgroup, where PES was inferior to SES. These results suggest that diabetes differentially affects the outcome of 1st generation DES.

Obesity

Asian AMI patients showed less body mass index (BMI), which could be partially explained by ethnic differences, and dietary patterns. Generally, obesity is associated with an increased risk of developing cardiovascular disease. However, it might also be associated with better outcomes after AMI (obesity paradox). The relationship between obesity and clinical outcomes after AMI was analyzed based on KAMIR data (13, 14). Obese patients had significantly lower in-hospital and overall mortality, whereas the highest mortality was present in the lowest BMI patients. In an adjusted model, the underweight (HR, 2.88; 95% CI, 1.17-6.08) remained as mortality risk factors. Obesity paradox was existed in Korean AMI patients, and it could be explained by better use of medical treatment, hemodynamic stability, and younger age in obese AMI patients.

Gender

Female AMI patients usually constitute one third of total AMI patients across all the western and Asian studies (Table 1). There has been controversy over the disparity between men and women with regard to the management and prognosis of AMI. Many studies on gender difference after AMI have demonstrated that women had a higher mortality and usually receive less aggressive treatment than men (15, 16). Those were partially true in contemporary era proved by KAMIR analysis. Consistently KAMIR analyses across different study population showed that female gender itself was not the independent risk factor for the poor outcomes, although female AMI patients had significantly higher in-hospital mortality and long-term MACE rates (17-19). Women had longer pain-to-door time and more severe hemodynamic status than men. Also, female AMI patients were older, and had more frequent comorbidites including hypertension,

Table 1. Comparison of baseline clinical characteristics

Study (Reference No.)	No. of patients	Mean or median age (yr old)	Female (%)	Hypertension (%)	Diabetes (%)	Dyslipidemia (%)	Smoking (%)	BMI (kg/m^2)	Prior MI (%)	Prior PCI (%)	Prior CABG (%)
GRACE (1)	11,389	66.3	33.5	57.8	23.3	43.6	56.7	26.9	32.0	14.0	12.6
SCAAR (2)	19,771	66	30.0	44.2	18.0		51.4		37.2	12.0	10.2
Western Denmark Heart Registgry (3)	12,395	63.5	27.9	36.2	11.5	41.0	34.4		25.3	8.8	5.8
NRMI-3,4 (4)	39,911	61	27.8	49.4	17.8	39.9	43.3		16.2	11.7	6.1
HIJAMI registry (5)	3,021	68.1	29.3	55.0	36.5	38.2	53.6	23.5	16.2	8.4	2.1
KAMIR	14,885	67.1	28.4	45.7	25.8	33.4	53.2	23.9	3.9	5.3	0.8
PASSION (40)	619	61	24.1	31.2	11.0	25.5	51.5		5.2	4.4	0.6
TYPHOON (41)	712	57.6	21.7	40.6	16.3	42.1	50.0				
SESAMI (42)	320	62.5	20.0	57.8	20.3		54.4		9.1	10.0	0.6

BMI, body mass index; CABG, coronary artery bypass grafting; GRACE, Global Registry of Acute Coronary Events; HIJAMI, Heart Institute of Japan Acute Myocardial Infarction registry; KAMIR, Korea Acute Myocardial Infarction Registry; MI, myocardial infarction; NRMI, National Registry of Myocardial Infarction; PASSION, Paclitaxel-Eluting Stent Versus Conventional Stent in Myocardial Infarction with ST-segment Elevation trial; SESAMI, Sirolimus-Eluting Stent Versus Bare-Metal Stent in Acute Myocardial Infarction; SACCAR, Swedish Coronary Angiography and Angioplasty Registry; TYPHOON, Trial to Assess the Use of the Cypher Stent in Acute Myocardial Infarction Treated with Balloon Angioplasty.

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diabetes, and dyslipidemia than male AMI patients. These characteristics of female AMI patients made gender effect. In the initial selection of treatment strategy, there was no gender difference between males and females in KAMIR (20).

RISK STRATIFICATION

A new risk scoring system in myocardial infarction (MI)

Risk stratification determined at the time of AMI could result in a substantial benefit if appropriate interventions are made in selected high-risk patients for MACEs. Thrombolysis in Myocardial Infarction (TIMI) risk score (21) and the Global Registry of Acute Coronary Events (GRACE) risk models (1) are well known risk scoring system to assess the risk of death across an entire spectrum of MI. However, these models were developed and validated on data from the late 1990s and early 2000s. Patients and procedural characteristics have been changed. Also, none of these risk models have focused on new parameters in current clinical situations. KAMIR score was devised to overcome these limitations based on the strongest factors independently associated with one year survival (Fig. 1) (22, 23). Also, KAMIR score focused more convenient and simple bedside clinical risk scoring system. KAMIR score composed of 6 independent variables related to the 1 yr mortality: age (65-74 yr old, 1 point; > 75 yr, 2 points), Killip class (II, 1 point; > II, 2 points), serum creatinine (≥ 1.5 mg/dL, 1 point), no in-hospital PCI (1 point), left ventricular ejection fraction (< 40%, 1 point), and admission glucose (> 180 mg/dL, 1 point). The KAMIR score demonstrated significant differences in predictive accuracy for 1-yr mortality compared to the GRACE score for the developmental and validation cohorts (Table 2).

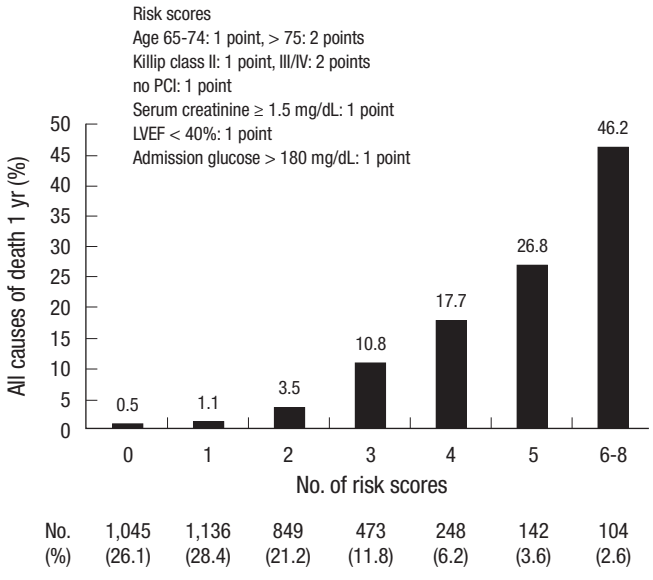

Fig. 1. KAMIR risk score predicting 1-yr death from acute myocardial infarction. LVEF, left ventricular ejection fraction.

TREATMENT STRATEGY

Pharmacologic strategy

Clopidogrel

A 600 mg loading doses of clopidogrel double bolus led to greater platelet inhibition than 300 mg standard loading doses in stable angina and non ST-segment elevation MI (NSTEMI) undergoing PCI (24). The Harmonizing Outcomes with Revascularization and Stents in Acute Myocardial Infarction (HORIZONS-AMI) trial reported that a 600 mg loading dose of clopidogrel may safely reduce 30 day ischemic adverse events rates compared with a 300 mg loading dose in patients with ST-segment elevation MI (STEMI) undergoing primary PCI (25). However, most of the data about the loading doses of clopidogrel came from the Western patients. Because of relatively smaller body weight, different degree of platelet aggregation, and possible ethnic differences in clopidogrel response, the optimal clopidogrel loading dose in Asian patients may not be same as that in Western patients. Bleeding and vascular complications, in–hospital and 1 yr clinical outcomes were compared between a standard loading dose group (300 mg; n = 1,447) and a high dose loading dose group (600 mg; n = 1,217) using KAMIR data (26). There were no differences in bleeding and vascular complications and in 1- and 12-month clinical outcomes even after the propensity score-matched analysis, suggesting that the standard loading dose of clopidogrel may be as safe and similarly effective as the high loading dose in Asian STEMI patients undergoing primary PCI.

Dual antiplatelet therapy (aspirin plus clopidogrel) for at least 12 months has been the standard antiplatelet therapy after DES implantation for the fear of stent thrombosis. Cilostazol emerged as alternative antiplatelet therapy having 10 to 30 times more potent antiplatelet action than that of aspirin. However, clinical outcomes after adding cilostazol to standard dual antiplatelet therapy remained unclear. Chen et al. compared clinical outcomes between triple antiplatelet therapy (aspirin plus clopidogrel plus cilostazol) and dual antiplatelet therapy (aspirin plus clopidogrel) in patients STEMI undergoing primary PCI (27). Triple antiplatelet therapy had lower incidence of in-hospital mortality (adjusted odds ratio [OR], 0.59; 95% CI, 0.36-0.94; $P = 0.026$) and 8-month mortality (adjusted OR, 0.60; 95% CI,

Table 2. Model performance in validation cohort

Variable	c-statistic (95% CI)		*P* value
	KAMIR score	GRACE Score	
Acute myocardial infarction	0.83 (0.79-0.88)	0.76 (0.72-0.83)	0.009
ST-segment elevation myocardial infarction	0.81 (0.74-0.87)	0.73 (0.65-0.80)	0.022
Non-ST-segment elevation myocardial infarction	0.86 (0.80-0.91)	0.78 (0.72-0.85)	0.028

GRACE, Global Registry of Acute Coronary Events; KAMIR, Korea Acute Myocardial Infarction registry.

0.41-0.89; P = 0.010) than dual antiplatelet therapy with no difference in the incidence of major bleeding, suggesting superiority of triple antiplatelet therapy over dual antiplatelet therapy in STEMI patients undergoing primary PCI with DES.

Statin

Statin clearly reduces the risk of death and cardiovascular events in both the primary setting and acute coronary syndrome. Current guidelines provide recommendation for initiating statin therapy for targeting optional therapeutic goal for low density lipoprotein cholesterol (LDL-C) less than 70 mg/dL in patients at high risk of cardiovascular events. However, whether to treat very high risk patients with statin who have already baseline LDL-C levels below 70 mg/dL remains troublesome. Clinical outcomes were compared between statin group (n = 607) and non-statin group (n = 447) in AMI patients with baseline LDL-C levels below 70 mg/dL (28). Statin therapy reduced 1 yr MACEs (adjusted HR, 0.56; 95% CI, 0.34-0.89; P = 0.015) mainly due to the risk reduction of cardiac death (HR, 0.45; 95% CI, 0.23-0.93; P = 0.031) and coronary revascularization (HR, 0.45; 95% CI, 0.24-0.85; P = 0.013). Statin might improve clinical outcomes even in patients with very low LDL-C levels.

PERCUTANEOUS CORONARY INTERVENTION

PCI has become the pivotal step in the management of AMI. KAMIR data showed that primary PCI was done in 75% of STEMI patients, and early invasive strategy was done in 48.5% NSTEMI patients. The rate of receiving reperfusion therapy among eligible STEMI patients also seemed to be higher than the previous reports. Primary PCI was performed in 29% eligible STEMI patients from the data of the National Registry of Myocardial Infarction (NRMI) in the USA (29) and in 27% from the Register of Information and Knowledge about Swedish Heart Intensive Care Admissions (RIKS-HIA) in Sweden (30). Moreover, the median door-to-balloon time was 90 min, which means that one-half of patients undergoing primary PCI received reperfusion in recommended time in KAMIR. From the data in NRMI-3 and -4, fewer than one-half of patients with STEMI received reperfusion in the recommended door-to-balloon time, and the mean door-to-balloon time was 108 min (95% CI, 160.5-109.4 min) (31). The growing interest in primary PCI and easy accessibility to the large-volume hospitals capable of performing PCI, most of which participated in the KAMIR, may account for the higher performance of primary PCI in KAMIR than in those reports.

Thrombolytic therapy is the treatment of choice for patients with STEMI when primary PCI is not available within 90 min. However, the best subsequent management of patients after thrombolytic therapy is unclear. Sim et al. evaluated the effect and optimal time of elective PCI after successful thrombolytic therapy (32). MACEs rates were significantly lower in patients who underwent PCI within 48 hr of thrombolytic therapy compared with those who underwent PCI later (4.1% vs 14.9%, P = 0.026) without no differences in hospital complications. In conclusion, early elective PCI within 48 hr of successful thrombolytic therapy for AMI might be safe and beneficial compared with PCI performed later.

Initial treatment strategy in non ST-segment elevation myocardial infarction

Recent studies indicate that early invasive strategy for high-risk patients with NSTEMI yields improved outcomes compared with early conservative strategy (33). In terms of overall population, KAMIR also showed better short-term and long-term clinical outcomes in patients with early invasive strategy (within 48 hr PCI) than late invasive strategy (34). However, when NSTEMI patients were categorized based on TIMI risk score, there was no significant difference of long term clinical outcomes in patients with low to moderate TIMI risk score, whereas significant difference in patients with high TIMI risk score (≥ 5 points) (34). Also, in NSTEMI patients with severe chronic kidney disease (CKD) (glomerular filtration rate [GFR] < 30 mL/min/1.73 m^2), early invasive strategy did not reduce 1 yr mortality compared with conservative treatment (35). Contrary, in NSTEMI patients with mild (60-89 mL/min/1.73 m^2) to moderate (30-59 mL/min/1.73 m^2) CKD patients had mortality benefit with early invasive treatment. Furthermore, early invasive strategy (within 24 hr PCI) was superior to the deferred invasive strategy (after 24 hr PCI) in patients with mild CKD. In the timing of an invasive strategy in patients with NSTEMI, KAMIR suggested early invasive strategy might improve clinical outcomes compared with early conservative treatment. However, risk stratification should be prior to the selection of initial treatment strategy.

Comparison of the efficacy and safety of drug eluting stents vs bare metal stents

DES has caused drastic changes in interventional cardiology. The recent guidelines also recommend to use DES as alternative to bare-metal stent (BMS) for primary PCI in STEMI. The DES penetration rate was 91% in both patients with STEMI and NSTEMI in KAMIR. That in KAMIR is notably higher than in that in other registry reports (2, 3, 36, 37), representing unique characteristic in Korean PCI practice as well as contemporary trends in PCI (Table 3).

In various subsets among AMI patients, comparison between BMS and DES or among DES subclass was made using KAMIR data. Sim et al. compared clinical outcomes of BMS vs DES in large coronary arteries (≥ 3.5 mm) with lesions < 25 mm in 985 AMI patients undergoing PCI (38). During 1 yr follow-up, the rates of target lesion revascularization (TLR) and target vessel revascularization (TVR) were lower in the DES group (2.5% vs

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Table 3. Comparison of characteristics of the trials

Study (Reference No.)	No. of patients	Primary end point	Individual end point	Stent type Proportion of BMS (%)	Clinical outcomes							Mean length of follow-up (month)
					BMS (%)	Any DES (%)	SES (%)	PES (%)	ZES (%)	*P* value	OR (95% CI)	
Registry												
GRACE (36)	5,093		Mortality	74	3.9	5.3	na	na	na	0.01	4.9	24
SCAAR (2)	13,738		Mortality	69.5	na	na	na	na	na	na	1.18 (1.04-1.35)	36
Western Denmark Heart Registgry (3)	12,395		Mortality	71.4	6.2	4.4	na	na	na	0.76	0.93 (0.60-1.46)	15
RESEARCH/ T-SEARCH (37)	505	All cause death, MI, TVR		36.3	18.6	na	9.7	15.4	na	0.048*	na	12
			All cause death		9.3	na	8.1	8.1	na	0.89*	na	
			TVR		7.7	na	1.6	6.6	na	0.021*	na	
KAMIR (9)†	4,416	All cause death, MI, TLR		9.0	na	na	8.6	11.6		0.014*	1.28 (1.05-1.56)	12
			All cause death		na	na	na	na	na	0.543	1.08 (0.85-1.36)	
			TLR		na	na	na	na	na	< 0.001	2.26 (1.47-3.45)	
Randomized trial												
PASSION (40)	619	Death from cardiac causes, MI, TLR			12.8	na	na	8.8	na	0.09	0.63 (0.37-1.07)	12
TYPHOON (41)	712	Target vessel related death, MI, TVR			14.3	na	7.3	na	na	0.004	na	12
SESAMI (42)	320		Major adverse cardiac events		16.8	na	6.8	na	na	0.02	na	12
Windecker et al. (10)	1,012	Death from cardiac causes, MI, TLR			na	na	6.2	10.8	na	0.009	0.56 (0.36-0.86)	9
			Death from cardiac causes		na	na	0.6	1.6	na	0.15	na	
			TLR		na	na	4.8	8.3	na	0.03	0.56 (0.34-0.93)	
Stettler et al. (12)	18,023	Mortality, MI, definite ST			na	na	na	na	na		0.96 (0.83-1.24)	48
			TLR		na	na	na	na	na		0.70 (0.56-0.84)	
KAMIR (9)‡	2,902	All cause death, MI, TLR			na	na	6.5	9.4	na		na	12
ENDEAVOR III (43)	415	All cause death, MI, TVR			na	na	22.2	na	14.0	0.05	na	60
			All cause death, MI		na	na	6.5	na	1.3	0.009	na	
			TVR		na	na	13.0	na	16.9	0.36	na	
KAMIR (44)§	873	All cause death, MI, TVR			na	na	13.6	na	20.5	0.004	1.07 (1.07-2.16)	12
			All cause death, MI		na	na	11.3	na	16.0	na	1.37 (0.91-2.05)	
			TVR		na	na	3.4	na	6.5	0.030	2.24 (1.18-4.24)	12
KOMER-AMI (45)	406	Cardiac death, MI, TLR			na	na	3.4	5.7	5.9	0.457	na	
			Cardiac death, MI		na	na	3.4	4.1	3.4	0.919	na	
			TLR		na	na	0	2.5	1.5	0.092	na	

**P* value: sirolimus eluting stent vs paclitaxel eluting stent; †KAMIR, before propensity score matching; ‡KAMIR, after propensity score matching comparing the clinical outcomes in patients with sirolimus eluting stent and in patients with paclitaxel eluting stent; §KAMIR, comparing the clinical outcomes in patients with sirolimus eluting stent and in patients with zotarolimus eluting stent. BMS, bare metal stent; DES, drug eluting stent; ENDEAVOR, Randomized Comparison of Zotarolimus-Eluting and Paclitaxel-Eluting Stents in Patients with Coronary Artery Disease; GRACE, Global Registry of Acute Coronary Events; KAMIR, Korea Acute Myocardial Infarction Registry; KOMER-AMI, Korean Multicentre Endeavor-Acute Myocardial Infarction; MI, myocardial infarction; na; non-available; OR, odds ratio; PASSION, Paclitaxel-Eluting Stent Versus Conventional Stent in Myocardial Infarction with ST-segment Elevation trial; PES, paclitaxel eluting stent; RESEARCH/T-SEARCH, Rapamycin-Eluting Stent Evaluated at Rotterdam Cardiology Hospital (RESEARCH) and Taxus-Stent Evaluated at Rotterdam Cardiology Hospital (T-SEARCH) registry; SCAAR, Swedish Coronary Angiography and Angioplasty Registry; SESAMI, Sirolimus-Eluting Stent Versus Bare-Metal Stent in Acute Myocardial Infarction; TLR, target lesion revascularization; TVR, target vessel revascularization; TYPHOON, Trial to Assess the Use of the Cypher Stent in Acute Myocardial Infarction Treated with Balloon Angioplasty; SES, sirolimus eluting stent; ZES, zotarolimus eluting stent.

5.9%, $P = 0.032$ and 3.1% vs 5.9%, $P = 0.041$) than BMS group with no difference in the rate of death or MI and MACEs, suggesting usefulness of DES in large vessels in AMI patients over BMS without compromising overall safety. Bae et al. compared clinical outcomes of BMS vs DES in 2,175 AMI patients with CKD (GFR < 60 mL/min) (39). One year MACEs were significantly higher in the BMS group (44% vs 26%, $P < 0.05$) than DES group which was mainly due to death rather than repeat intervention (44% vs 26%, $P < 0.05$). They concluded that DES implantation exhibits a favorable 1-yr clinical outcome than BMS implantation in AMI patients with CKD.

Comparison of the efficacy and safety among drug eluting stents

With regard to first generation DES, KAMIR investigators (9) reported that the patients with SES had a lower risk for repeated revascularization compared with patients receiving PES, similar to randomized trials (10, 11) and collaborative network meta-analysis comprising 40 randomized trials (12). Also, Korean AMI patients showed similar 1 yr clinical outcomes compared with those trials (Table 3) (10, 11, 40-42). With regard to comparison between first generation DES and second generation DES, KAMIR showed different results from other trials (Table 3). The Randomized Comparison of Zotarolimus-Eluting and Paclitaxel-Eluting Stents in Patients with Coronary Artery Disease (ENDEAVOR III) trial showed significant lower MACEs in zotarolimus (ZES) implanted patients compared with SES implantation patients (14.0% vs 22.2%, $P = 0.05$), mainly driven by the risk reduction of hard end-point (death, MI) with no difference in TVR rate (43). In contrast, KAMIR showed significant lower MACEs in SES implanted patients compared with ZES implantation patients (13.6% vs 20.5%, $P = 0.004$), mainly driven by the risk reduction of TVR with no difference in the rate of hard end-point (death, MI) (44). This difference was supported by the Korean Multicentre Endeavor (KOMER)-AMI trial (45), randomized trial in Korea to evaluate the efficacy and safety of ZES, SES, PES. KOMER-AMI trial showed that a trend towards a lower rate of TLR in SES implanted patients than ZES implanted patients (0% vs 1.5%, $P = 0.092$) with no difference in hard end-point (cardiac death, MI). This difference suggested that clinical outcomes treated with second generation DES in Asians might act in a different manner compared with western population, whereas those treated with first generation DES were similar to other trials. Therefore, further trials are needed to clarify universal clinical outcomes about second generation DES, taking into consideration of racial differences.

CONCLUSION

KAMIR revealed numerous unknown characteristics and results in Korean AMI patients. Korean AMI patients had similar clinical risk factors and outcomes compared with western AMI patients. However, Korean AMI patients had higher prevalence of diabetes mellitus and lower BMI contrary to western AMI patients. KAMIR score was easy and accurate for the prediction of adverse clinical outcomes. KAMIR also suggested new treatment strategy in Asian AMI patients. Standard loading dose of clopidogrel was enough for Asian AMI patients, and statin improved clinical outcomes even in patients with very low LDL-C levels. ZES, the 2nd generation DES, was not superior to SES or PES, the 1st generation DES. KAMIR has several limitations, such as retrospective analysis design and weak clinical follow-up parameters. KorMI, as the sequent study of KAMIR, reinforced these weak points and is expected to get better results with more than 38,000 enrolled AMI patients. In conclusion, KAMIR made a cornerstone in the study of Korean AMI, has been evolving itself to overcome the pitfall of KAMIR, and expected to be new standards of care for Asian AMI.

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