Two-Year Clinical Outcomes of Biodegradable Polymer vs. Durable Polymer Drug-Eluting Stent Implantation in Patients With End-Stage Renal Disease on Dialysis

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Background: There are limited data comparing clinical outcomes between biodegradable polymer and durable polymer drug-eluting stents (BP-DES and DP-DES, respectively) in patients with end-stage renal disease (ESRD).

Methods and Results: This study enrolled 229 ESRD patients who underwent successful percutaneous coronary intervention (PCI) for 400 lesions with 472 DES, with 2-year clinical outcomes compared between the BP-DES and DP-DES groups. The primary outcome measure was the incidence of target lesion revascularization (TLR), whereas secondary outcome measures were the occurrence of cardiac death (CD), myocardial infraction (MI), stent thrombosis (ST), target vessel revascularization (TVR), non-TVR, and major adverse cardiac events (MACE), defined as a composite of CD, MI, and TVR. Multivariate analysis was used to identify predictors of TLR occurrence. The 2-year incidence of TLR did not differ significantly between the BP-DES and DP-DES groups (P=0.274). In addition, there were no significant differences in the 2-year incidence of CD (P=0.144), MI (P=0.812), ST (P=0.241), TVR (P=0.434), non-TVR (P=0.375), or MACE (P=0.841) between the 2 groups. Multivariate analysis showed that diabetes (P=0.021) was independently associated with TLR occurrence.

Conclusions: BP-DES and DP-DES had comparable safety and efficacy profiles over a 2-year follow-up period after PCI in ESRD patients.

Key Words: Biodegradable polymer drug-eluting stent; Coronary artery disease; Durable polymer drug-eluting stent; End-stage renal disease; Hemodialysis

It is well established that chronic kidney disease (CKD) is a risk factor for ischemic heart disease, with a strong association between reductions in glomerular filtration rate and increases in all-cause and cardiovascular mortality.[1] Among patients with end-stage renal disease (ESRD) on dialysis, approximately half have evidence of ischemic heart disease.[2] The proportion of CKD patients undergoing percutaneous coronary intervention (PCI) has been growing due to the high prevalence of coronary artery disease and the rapid increase in risk factors, such as old age, diabetes, and hypertension.[3] However, PCI for CKD patients, especially for ESRD patients on dialysis, remains challenging because of the high rate of adverse cardiac events, such as restenosis or stent thrombosis (ST), even in the era of second-generation durable polymer drug-eluting stents (DP-DES).[4] There have been rapid advances in stent platforms and polymers, and biodegradable polymers have been developed to reduce the rate of adverse cardiac events

after DP-DES implantation.[5] Although biodegradable polymer drug-eluting stents (BP-DES) have demonstrated non-inferior safety and efficacy compared with DP-DES in several randomized clinical trials (RCT),[6,7] ESRD patients were excluded from these trials based on concerns of increased adverse events and low procedural success rates. Therefore, there are limited data about clinical outcomes after PCI using BP-DES in ESRD patients. Thus, the aim of the present study was to compare 2-year clinical outcomes between BP-DES and DP-DES in ESRD patients on dialysis after PCI.

Methods

Study Design and Patients
This study was a non-randomized single-center observational retrospective study. A total of 365 ESRD patients who underwent PCI for 726 lesions at the Kansai Rosai
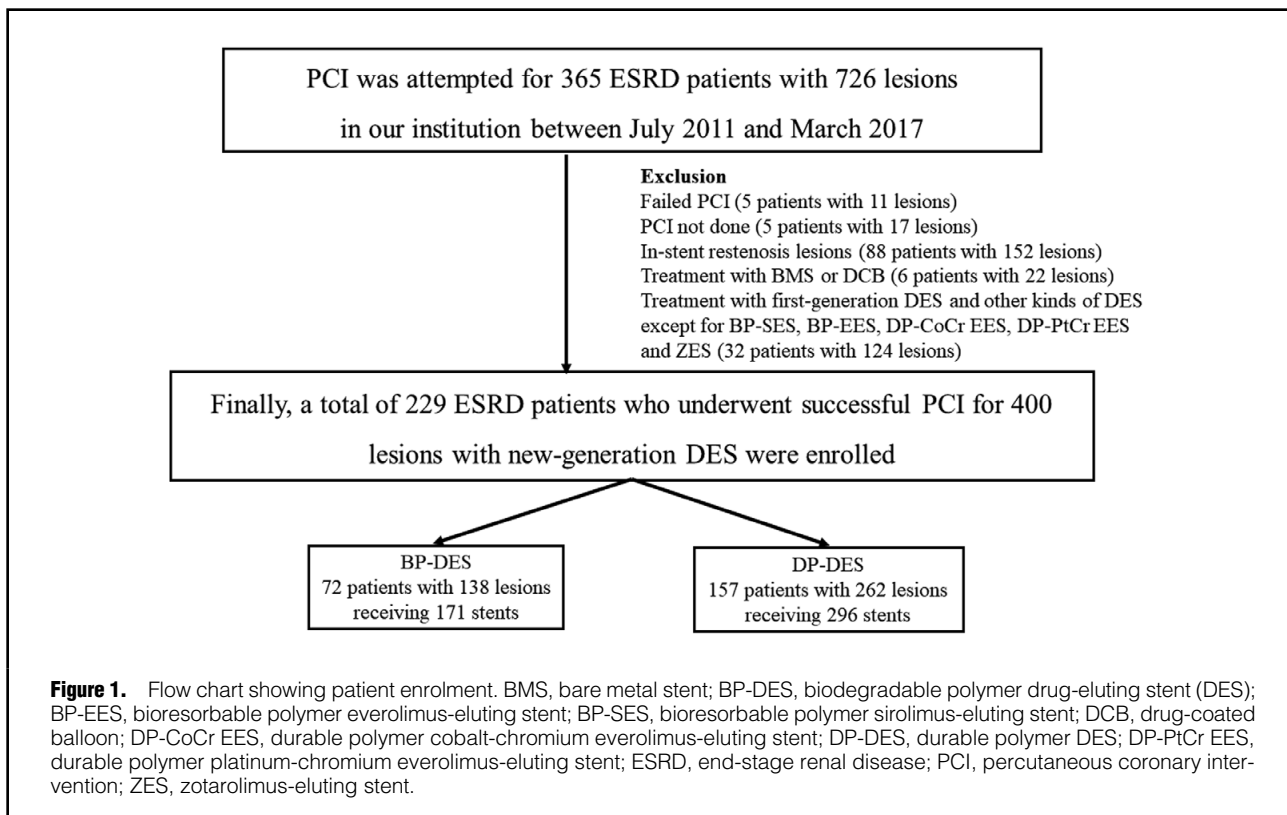
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PCI was attempted for 365 ESRD patients with 726 lesions in our institution between July 2011 and March 2017

Exclusion
Failed PCI (5 patients with 11 lesions)
PCI not done (5 patients with 17 lesions)
In-stent restenosis lesions (88 patients with 152 lesions)
Treatment with BMS or DCB (6 patients with 22 lesions)
Treatment with first-generation DES and other kinds of DES
except for BP-SES, BP-EES, DP-CoCr EES, DP-PtCr EES
and ZES (32 patients with 124 lesions)

Finally, a total of 229 ESRD patients who underwent successful PCI for 400 lesions with new-generation DES were enrolled

BP-DES
72 patients with 138 lesions
receiving 171 stents

DP-DES
157 patients with 262 lesions
receiving 296 stents

Figure 1. Flow chart showing patient enrolment. BMS, bare metal stent; BP-DES, biodegradable polymer drug-eluting stent (DES); BP-EES, bioresorbable polymer everolimus-eluting stent; BP-SES, bioresorbable polymer sirolimus-eluting stent; DCB, drug-coated balloon; DP-CoCr EES, durable polymer cobalt-chromium everolimus-eluting stent; DP-DES, durable polymer DES; DP-PtCr EES, durable polymer platinum-chromium everolimus-eluting stent; ESRD, end-stage renal disease; PCI, percutaneous coronary intervention; ZES, zotarolimus-eluting stent.

Hospital Cardiovascular Center between July 2011 and March 2017 were evaluated. To be eligible for study inclusion, patients had to be ≥18 years of age and good candidates for PCI, as determined by the heart team of cardiologists and surgeons at the Kansai Rosai Hospital Cardiovascular Center. In addition, patients had to have clinical evidence of ischemic heart disease and/or a positive functional study.

The BP-DES used in this study was either a bioresorbable polymer sirolimus-eluting stent (BP-SES; Ultimaster™; Terumo Corporation, Tokyo, Japan) or a bioresorbable polymer everolimus-eluting stent (BP-EES; Synergy™; Boston Scientific, Natick, MA, USA). The DP-DES used in this study were either a durable polymer cobalt-chromium everolimus-eluting stent (DP-CoCr EES; Xience™; Abbott Vascular, Santa Clara, CA, USA), a durable polymer platinum-chromium everolimus-eluting stent (DP-PtCr EES; Promus Element stent; Boston Scientific), or a slow-release zotarolimus-eluting stents (ZES; Resolute™; Medtronic, Minneapolis, MN, USA).

Of the 365 ESRD patients (726 lesions) evaluated for this study, 136 patients (326 lesions) were excluded for the following reasons: failed PCI (5 patients, 11 lesions), PCI was not done (5 patients, 17 lesions), in-stent restenosis lesions (88 patients, 152 lesions), treatment with a bare metal stent (BMS) or drug-coated balloon (DCB; 6 patients, 22 lesions), and treatment with first-generation and drug-eluting stents (DES) other than BP-SES, BP-EES, DP-CoCr EES, DP-PtCr EES, and ZES (32 patients for 124 lesions). This left 229 ESRD patients who underwent successful PCI for 400 lesions with new-generation DES eligible for enrolment in this study, and these patients were divided into 2 groups, namely BP-DES and DP-DES

groups (**Figure 1**). Patients were followed-up by means of telephone interviews, a review of hospital records, or through outpatient visits.

This study was conducted according to the ethical guidelines of the Declaration of Helsinki. The study protocol was approved by the Medical Ethics Committee of Kansai Rosai Hospital. All individual participants included in the study provided written informed consent prior to enrollment.

Study Procedures
PCI procedures were performed according to standard practice. All further procedures, lesion predilation, stenting or post-stenting dilation, and the use of debulking devices or imaging modalities were left to the operator's discretion. All patients received dual antiplatelet therapy (DAPT) according to hospital practice. Continuation of DAPT was recommended for at least 12 months. Antiplatelet therapy beyond 12 months was at the discretion of the treating physician considering prevailing guidelines.

Quantitative Coronary Angiography (QCA)
Coronary angiography was performed in at least 10 projections. The view showing the most severe stenosis was selected for QCA, which was subsequently performed using a computerized angiographic analysis system (CAAS Workstation 5.11; Pie Medical Imaging, Maastricht, Netherlands) at the same angle of projection prior to and immediately after PCI.[8]

Outcome Measures and Definitions
The primary outcome measure was the incidence of target lesion revascularization (TLR) at 2 years. Secondary out-

Table 1. Baseline Patient Characteristics

	BP-DES (n=72)	DP-DES (n=157)	P value
Mean (±SD) age (years)	72±11	71±10	0.266
Male sex	48 (66.6)	120 (76.4)	0.147
Hypertension	65 (90.3)	129 (82.2)	0.165
Dyslipidemia	34 (47.2)	65 (41.4)	0.473
Diabetes	40 (55.6)	96 (61.1)	0.470
Hyperuremia	10 (13.9)	21 (13.4)	1.000
Current smoker	18 (25.0)	25 (16.0)	0.144
Previous MI	13 (18.1)	24 (15.3)	0.699
Previous PCI	26 (36.1)	41 (26.1)	0.159
Previous CABG	5 (6.9)	13 (8.3)	0.799
ACS	21 (29.2)	40 (25.4)	0.629
Unstable angina pectoris	16 (22.2)	31 (19.7)	
STEMI	4 (5.6)	6 (3.8)	
NSTEMI	1 (1.4)	3 (1.9)	
Chronic heart failure	12 (16.7)	25 (15.9)	1.000
Atrial fibrillation	6 (8.3)	16 (10.2)	0.811
Cerebrovascular disease	4 (5.6)	10 (6.4)	1.000
Peripheral arterial disease	26 (36.1)	55 (35.0)	0.883
Malignancy	5 (6.9)	9 (5.7)	0.769
Aortic dissection	2 (2.8)	4 (2.5)	1.000

Unless indicated otherwise, data are given as n (%). ACS, acute coronary syndrome; BP-DES, biodegradable polymer drug-eluting stent (DES); CABG, coronary artery bypass grafting; DP-DES, durable polymer DES; MI, myocardial infarction; NSTEMI, non-ST-elevation myocardial infarction; PCI, percutaneous coronary intervention; STEMI, ST-elevation myocardial infarction.

come measures were the occurrence of cardiac death (CD), ST, myocardial infraction (MI), target vessel revascularization (TVR), non-TVR, and major adverse cardiac events (MACE), defined as a composite of CD, MI, and TVR, at 2 years. TLR was defined as clinically driven repeat revascularization caused by a >50% stenosis within the stent or within a 5-mm border proximal or distal to the stent. CD was defined as any death resulting from an evident cardiac cause, any death related to PCI, an unwitnessed death, or death from unknown causes. ST was defined as definite stent thrombosis according to the Academic Research Consortium definition.[9] MI was defined as Type 1–Type 3 or Type 4b based on the Third Universal Definition of Myocardial Infarction.[10] TVR was defined as any repeat PCI or surgical bypass of any segment within the entire major coronary vessel that was proximal or distal to a target lesion, including upstream and downstream branches, and the target lesion itself. Non-TVR was defined as any repeat PCI or surgical bypass of any segment of the non-target coronary artery.

Statistical Analysis
Data are expressed as the mean±SD or as counts and percentages. For discrete variables, the significance of differences between 2 groups were analyzed using χ^2 or Fisher's exact tests, as appropriate. Multivariable Cox proportional hazards regression analysis, which includes baseline confounding factors, was conducted. Various clinical outcomes were estimated using Kaplan-Meier curves, and differences between groups were compared with the log-rank test. The following available variables were tested for potential relevance to TLR occurrence: sex (male), hypertension, dyslipidemia, diabetes, hyperuremia, current

smoker, previous MI, previous PCI, previous coronary artery bypass grafting, acute coronary syndrome, chronic heart failure, atrial fibrillation, cerebrovascular disease, peripheral arterial disease, malignancy, aortic dissection, lesion location, American College of Cardiology (ACC)/ American Heart Association (AHA) lesion types, chronic total occlusion, ostial, ostial right coronary artery, bifurcation, multivessel disease, direct stenting, the use of rotational atherectomy, BP-DES, and stent length ≥32 mm and vessel size ≤2.5 mm, which were defined based on the diameter of the stent used and post-dilation. Two-tailed $P<0.05$ was considered statistically significant. All statistical analyses were performed using SPSS version 25 (IBM Corp., Armonk, NY, USA).

Results

Baseline Patient, Lesion and Procedural Characteristics
In all, 229 ESRD patients who underwent successful PCI for 400 lesions with new-generation DES were enrolled in the study. Baseline patient characteristics are summarized in **Table 1** and were similar between the BP-DES and DP-DES groups. Lesion and procedural characteristics are summarized in **Table 2**; again, there were no significant differences between the 2 groups. Approximately 80% of the lesions were ACC/AHA Type B2/C and multivessel disease in ESRD patients. All patients underwent PCI using an intravascular imaging device (intravascular ultrasound or optimal coherence tomography) and approximately 20% of the patients underwent rotational atherectomy.

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Table 2. Lesion and Procedural Characteristics

	BP-DES (n=138)	DP-DES (n=262)	P value
Lesion characteristics			
Lesion location			0.170
LAD	47 (34.1)	85 (32.4)	
LCX	28 (20.3)	66 (25.2)	
RCA	47 (34.1)	93 (35.5)	
LMT	16 (11.5)	18 (6.9)	
ACC/AHA Type B2/C	118 (85.5)	209 (79.8)	0.175
Chronic total occlusion	4 (2.9)	3 (1.1)	0.240
Ostial	22 (15.9)	38 (14.5)	0.769
Bifurcation	56 (40.6)	86 (32.8)	0.126
Multivessel disease	114 (82.6)	207 (79.0)	0.430
Procedural characteristics			
Use of imaging device	138 (100)	262 (100)	0.489
Direct stenting	8 (5.8)	26 (9.9)	0.189
Use of rotational atherectomy	25 (18.1)	40 (15.3)	0.478
No. stents	170	302	
CoCr-EES (Xience®)	–	219	
PtCr-EES (Promus®)	–	53	
ZES (Resolute®)	–	30	
U-SES (Ultimaster®)	91	–	
PtCr-EES (Synergy®)	79	–	
Diameter of stent used (mm)	3.06±0.51	3.07±0.45	0.928
Total stent length (mm)	23.20±8.28	22.36±8.92	0.345
Post-dilation	117 (84.8)	212 (80.9)	0.409

Unless indicated otherwise, data are given as the mean±SD or n (%). Lesion characteristics were assessed by angiography. ACC, American College of Cardiology; AHA, American Heart Association; CoCr-EES, cobalt-chromium everolimus-eluting stent; LAD, left anterior descending coronary artery; LCX, left circumflex coronary artery; LMT, left main trunk; PtCr-EES, platinum-chromium everolimus-eluting stent; RCA, right coronary artery; SES, sirolimus-eluting stent; ZES, zotarolimus-eluting stent. Other abbreviations as in Table 1.

Table 3. Quantitative Coronary Angiography (QCA)

	BP-DES (n=138)	DP-DES (n=262)	P value
Preprocedural QCA			
Reference vessel diameter (mm)	2.55±0.65	2.55±0.74	0.213
Minimal lumen diameter (mm)	0.90±0.46	0.96±0.47	0.996
Lesion length (mm)	21.7±13.1	18.7±12.1	0.022
Diameter stenosis (%)	66.6±14.0	62.9±14.1	0.013
Post-procedural QCA			
Reference vessel diameter (mm)	3.04±0.51	2.85±0.62	0.003
Minimal lumen diameter (mm)	2.57±0.48	2.37±0.51	<0.001
Diameter stenosis (%)	15.6±5.8	16.6±8.3	0.141

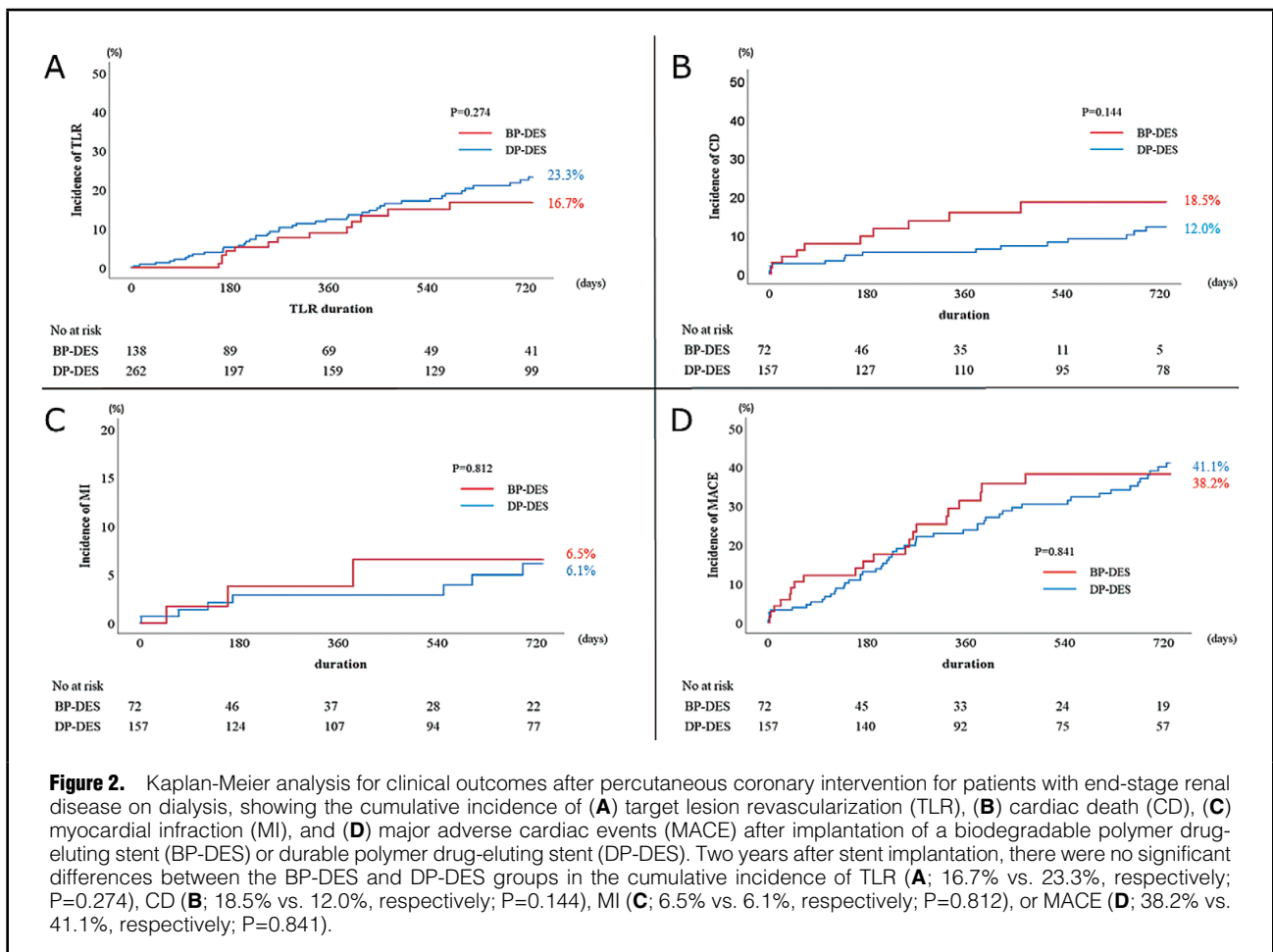Data are given as the mean±SD. Abbreviations as in Table 1.

QCA

The QCA findings are summarized in **Table 3**. Lesion length was longer in the BP-DES than DP-DES group and, at the preprocedural assessment, diameter stenosis was smaller in the BP-DES than DP-DES group. However, reference vessel diameter and minimum lumen diameter at the post-procedural assessment were larger in the BP-DES than DP-DES group. Consequently, diameter stenosis was not significantly different between the 2 groups (P=0.141).

Clinical Outcomes

The cumulative incidence of clinical outcomes at 2 years is listed in **Table 4** and shown in **Figure 2**. The 2-year incidence of TLR was not significantly different between the BP-DES and DP-DES groups (16.7% vs. 23.3%, respectively; P=0.274; **Figure 2A**). Similarly, there were no significant differences between BP-DES and DP-DES groups in the 2-year incidence of CD (18.5% vs. 12.0%, respectively; P=0.144; **Figure 2B**), MI (6.5% vs. 6.1%, respectively; P=0.812; **Figure 2C**), ST (0% vs. 0%, respectively; P=0.241), TVR (23.4% vs. 28.7%, respectively; P=0.434),

Table 4. Two-Year Cumulative Incidence of Clinical Outcomes Between the BP-DES and DP-DES Groups, Determined by Kaplan-Meier Analysis

	Cumulative incidence (%)		P value
	BP-DES (72 patients, 138 lesions)	DP-DES (157 patients, 262 lesions)	
TLR	16.7	23.3	0.274
CD	18.5	12.0	0.144
ST	0	0	0.241
MI	6.5	6.1	0.812
TVR	23.4	28.7	0.434
Non-TVR	25.8	31.4	0.375
MACE	38.2	41.1	0.841

CD, cardiac death; MACE, major adverse cardiac events; ST, stent thrombosis; TLR, target lesion revascularization; TVR, target vessel revascularization. Other abbreviations as in Table 1.

Figure 2. Kaplan-Meier analysis for clinical outcomes after percutaneous coronary intervention for patients with end-stage renal disease on dialysis, showing the cumulative incidence of (**A**) target lesion revascularization (TLR), (**B**) cardiac death (CD), (**C**) myocardial infraction (MI), and (**D**) major adverse cardiac events (MACE) after implantation of a biodegradable polymer drug-eluting stent (BP-DES) or durable polymer drug-eluting stent (DP-DES). Two years after stent implantation, there were no significant differences between the BP-DES and DP-DES groups in the cumulative incidence of TLR (**A**; 16.7% vs. 23.3%, respectively; P=0.274), CD (**B**; 18.5% vs. 12.0%, respectively; P=0.144), MI (**C**; 6.5% vs. 6.1%, respectively; P=0.812), or MACE (**D**; 38.2% vs. 41.1%, respectively; P=0.841).

non-TVR (25.8% vs. 31.4%, respectively; P=0.375), and MACE (38.2% vs. 41.1%, respectively; P=0.841; **Figure 2D**). After multivariate analysis, diabetes (hazard ratio [HR] 2.09; 95% confidence interval [CI] 1.12–3.88; P=0.021) was found to be independently associated with TLR occurrence in ESRD patients on dialysis (**Table 5**).

Discussion

In this study we compared 2-year clinical outcomes between BP-DES and DP-DES in ESRD patients with coronary artery disease after PCI. The main findings of this study are that: (1) there was no significant difference between the BP-DES and DP-DES groups in the 2-year incidence of TLR (16.7% vs. 23.3%, respectively; P=0.274); (2) there was no significant difference between the BP-DES

Table 5. Predictors of TLR

	Unadjusted HR		Adjusted HR	
	HR (95% CI)	P value	HR (95% CI)	P value
Male sex	0.89 (0.50–1.57)	0.687		
Hypertension	1.57 (0.67–3.67)	0.296		
Dyslipidemia	1.10 (0.65–1.86)	0.724		
Diabetes	2.18 (1.17–4.06)	0.014	2.09 (1.12–3.88)	0.021
Hyperuremia	1.55 (0.82–2.93)	0.179		
Current smoker	0.75 (0.35–1.58)	0.441		
Previous MI	1.32 (0.69–2.56)	0.404		
Previous PCI	1.59 (0.94–2.68)	0.086		
Previous CABG	1.23 (0.49–3.07)	0.665		
ACS	1.67 (0.95–2.93)	0.073		
Chronic heart failure	0.65 (0.28–1.51)	0.316		
Atrial fibrillation	0.99 (0.43–2.32)	0.990		
Cerebrovascular disease	1.41 (0.51–3.91)	0.506		
Peripheral arterial disease	1.51 (0.88–2.57)	0.136		
Malignancy	0.75 (0.35–1.58)	0.441		
Aortic dissection	0.05 (0.00–30.1)	0.354		
Lesion location	1.17 (0.95–1.46)	0.146		
ACC/AHA Type B2/C	2.91 (1.05–8.05)	0.040	2.23 (0.78–6.38)	0.136
Chronic total occlusion	1.14 (0.16–8.25)	0.897		
Ostial	0.85 (0.39–1.88)	0.691		
Ostial right coronary artery	1.13 (0.35–3.63)	0.833		
Bifurcation	1.77 (1.04–2.99)	0.033	1.51 (0.89–2.58)	0.128
Multivessel disease	2.25 (0.96–5.25)	0.061		
Direct stenting	0.36 (0.09–1.47)	0.153		
Rotational atherectomy	0.73 (0.33–1.61)	0.437		
BP-DES	0.71 (0.38–1.32)	0.277		
Stent length ≥32 mm	1.80 (1.04–3.14)	0.037	1.47 (0.84–2.59)	0.180
Vessel size ≤2.5 mm	1.56 (0.88–2.75)	0.129		
Post-dilation	1.60 (0.69–3.73)	0.276		

Data are given as unadjusted or adjusted hazard ratios (HRs) for target lesion revascularization with 95% confidence intervals (CIs). Abbreviations as in Tables 1,2,4.

and DP-DES groups in the 2-year incidence of CD, ST, MI, TVR, and non-TVR; and (3) diabetes was independently associated with TLR occurrence in ESRD patients.

A patient-level pooled analysis on 12,426 patients undergoing PCI using second-generation DES showed that the cumulative incidence of target lesion failure was 24.1% during the study period (median follow-up duration 1,046 days) in ESRD patients on dialysis.[4] The outcomes of that study, including the cumulative incidence of TLR, CD, and MI, were also consistent with those of the present study. Data from retrospective analyses of >35,000 dialysis patients over a 7-year period noted a significant reduction in death, death or MI, and death, MI, or repeat revascularization at 1 year among patients receiving DES compared with those receiving BMS.[11,12]

However, there are few studies comparing BP-DES and DP-DES in patients with ESRD on dialysis. In the present study, we found that the 2-year clinical outcomes were not significantly different between these 2 groups.

The polymer in BP-DES consists of polylactic acid that fully degrades into carbon dioxide and water within 3–4 months.[6] Despite this particular advantage of BP-DES, the long-term clinical outcomes are debatable compared with DP-DES. Although BP-DES are expected to improve clinical outcomes compared with DP-DES because of their thin struts, which reduce stent thrombogenicity,[13] and the biodegradable polymer, it was reported that BP-DES induced a severe histiolymphocytic and fibromuscular reaction.[14,15] In a meta-analysis of RCTs, BP-DES had similar 1-year clinical outcomes to contemporary DP-DES.[16] Furthermore, BP-DES were found to have similar safety and efficacy profiles to DP-DES in another meta-analysis of RCTs at the longest available follow-up (mean duration 26 months).[17] The present study also showed that the incidence of TLR (HR 0.709; 95% CI 0.381–1.318; P=0.274) was similar for BP-DES and DP-DES in ESRD patients on dialysis. This suggests that we may expand the results of the previous meta-analysis to ESRD patients on dialysis. In addition, the incidence of TLR is very high in both groups of ESRD patients because of: (1) insufficient drug penetration for calcified lesions; (2) the loss of polymer during delivery for calcified lesions; (3) stent fracture; and (4) stent underexpansion.[18] These issues are not resolved even if BP-DES are used instead of DP-DES, and clinical outcomes in the present study were similar between the 2 groups of ESRD patients.

In a previous report, multivariable Cox regression analysis indicated that independent predictors of TLF among

CKD patients were left main or 3-vessel disease lesions and multivessel PCI, old age, male sex, peripheral vascular disease, diabetes, and clinical presentation of acute MI.[4] In the present study, diabetes was independently associated with TLR occurrence in ESRD patients, which is in line with the previous study. It has been reported that the metabolic abnormalities that characterize diabetes, such as hyperglycemia, increased free fatty acids, and insulin resistance, each provoke molecular mechanisms that contribute to vascular dysfunction. This may contribute to the cellular events that cause atherosclerosis and subsequently increase the risk of adverse cardiovascular events that occur in patients with diabetes and atherosclerosis.[19] ESRD Patients with diabetes had worse outcomes than ESRD patients without diabetes, and more careful follow-up was needed for diabetic ESRD patients.

ST did not occur in either group in the present study. It has been reported that one of the causes of early ST, defined ST occurring within 1 month after stent implantation, was stent underexpansion.[20] In the present study, patients underwent PCI using imaging devices, and approximately 20% of patients underwent rotational atherectomy. Lesion preparation to minimize underexpansion may have been crucial in avoiding early ST in ESRD patients on dialysis. Very late ST (VLST), defined as ST occurring >1 year after stent implantation, was not detected. It has been reported that an abnormal vascular response causes VLST after DES implantation.[21] BP-DES has been expected to decrease the occurrence of VLST because the polymer, which is suspected as one of the causes of VLST, is completely absorbed within 3–4 months after stent implantation. Although ST was not detected in either group in this study, possibly due to the limited sample size, further studies are needed to evaluate the incidence of VLST after BP-DES vs. DP-DES implantation.

Study Limitations

This study has several limitations. First, the present study was a single-center non-randomized observational study; thus, there may be some under-reporting and/or missed data. Second, even though multivariate analysis was performed, variables not included in the analysis may have affected the study outcomes. Finally, because this study enrolled only Japanese patients and used imaging devices in all patients, the results may not be generalizable to patients of other ethnicities in different parts of the world.

Conclusions

In conclusion, BP-DES had comparable safety and efficacy profiles to DP-DES over a 2-year follow-up period after PCI in patients with ESRD on dialysis. However, further development of DES is necessary because the adverse event rate was still high, even with BP-DES.

Disclosures

None.

IRB Information

This study was approved by the Medical Ethics Committee of Kansai Rosai Hospital (15D081 g).

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