Clinical and angiographic outcomes of bioabsorbable vs. permanent polymer drug-eluting stents in Sweden: a report from the Swedish Coronary and Angioplasty Registry (SCAAR)

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Aims

Randomized clinical trials have consistently demonstrated the non-inferiority of bioabsorbable polymer drug-eluting stents (BP-DES) with respect to DES having permanent polymers (PP-DES). To date, the comparative performance of BP- and PP-DES in the real world has not been extensively investigated.

Methods and results

From October 2011 to June 2016, we analysed the outcomes associated with newer generation DES use in Sweden. After stratification according to the type of DES received at the index procedure, a total of 16 504 and 79 106 stents were included in the BP- and PP-DES groups, respectively. The Kaplan–Meier estimates for restenosis at 2 years were 1.2% and 1.4% in BP- and PP-DES groups, respectively. Definite stent thrombosis (ST) was low in both groups (0.5% and 0.7% in BP- and PP-DES groups, respectively). The adjusted hazard ratio (HR) for either restenosis or definite ST did not differ between BP- and PP-DES [adjusted HR 0.95, 95% confidence interval (CI) 0.74–1.21; $P=0.670$ and adjusted HR 0.79, 95% CI 0.57–1.09; $P=0.151$, respectively]. Similarly, there were no differences in the adjusted risk of all-cause death and myocardial infarction (MI) between the two groups (adjusted HR for all-cause death 1.01, 95% CI 0.82–1.25; $P=0.918$ and adjusted HR for MI 1.05, 95% CI 0.93–1.19; $P=0.404$).

Conclusion

In a large, nationwide, and unselected cohort of patients, percutaneous coronary intervention with BP-DES implantation was not associated with an incremental clinical benefit over PP-DES use at 2 years follow-up.

Keywords

Drug-eluting stents • Bioabsorbable polymer • Permanent polymer • Stent failure • Clinical outcomes

Introduction

By overcoming most of the shortcomings of coronary balloon angioplasty (i.e. abrupt vessel closure, vessel recoil, barotrauma-induced

intimal dissection, and late negative remodelling), stent implantation has become the standard of practice during percutaneous coronary intervention (PCI).¹ To date, modern drug-eluting stents (DES) have demonstrated remarkable safety and efficacy as compared to

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previous DES generations and bare metal stents. Even though the clinical performance of PCI has been significantly advanced by newer DES, stent failure [i.e. restenosis leading to repeat revascularization and stent thrombosis (ST)] represents an enduring weakness of modern PCI which challenges the therapeutic decision-making between different revascularization strategies in more complex patient and lesion subsets.^{2,3}

Through decades, advances in stent technology have been instrumental in improving the long-term outcomes of PCI.⁴ Two pillars of stent device iteration have been the progressive reduction of strut thickness with preserved radial strength and the use of antiproliferative drugs, eluted from polymers embedded within the metallic platforms, to counteract neo-intimal hyperplasia. However, concerns have been raised about the biological response (i.e. inflammation) to the lifelong persistence of metal and polymers after stenting.⁵ To partly overcome these issues, drug-eluting stents with a bioabsorbable polymer (BP-DES) have been developed.⁶ This technology is thought to reduce the rate of adverse events after DES implantation by tempering the chronic inflammation process related to permanent polymers of conventional DES platforms (PP-DES).⁷

Randomized clinical trials have consistently demonstrated the non-inferiority of BP-DES as compared to PP-DES.^{8–11} Most of these studies, however, had a short duration of follow-up (i.e. 1 year) and limited statistical power to detect differences in low-frequency events such as ST and restenosis. As a consequence, the theoretical benefits of BP-DES technology, which are expected to accrue over time, have not been firmly demonstrated. To fill this gap, we investigated the comparative outcomes of BP- and PP-DES implantation in a large and unselected cohort of patients undergoing PCI with an extended follow-up duration of 2 years.

Methods

Patient population

From October 2011, when the first thin-strut BP-DES was implanted in Sweden, to June 2016, we analysed data from all consecutive patients undergoing PCI with newer generation DES for the treatment of either stable coronary artery disease or acute coronary syndromes. All patients were included in the prospective Swedish Coronary Angiography and Angioplasty Registry (SCAAR), the details of which have been previously reported.¹² Briefly, SCAAR is a nationwide, web-based registry which collects data of patients undergoing coronary angiography or PCI across all Swedish cardiac catheterization laboratories ($N = 29$). Clinical, angiographic, and procedural characteristics are entered in the web-portal by physicians and nurses at the time of the index procedure. Data entered in the registry are regularly monitored for quality and accuracy; consistency with source clinical files is at the level of 97%. The information is then transferred to a central server located at the Uppsala Clinical Research Center.

Of note, the SCAAR registry offers the unique opportunity of collecting the characteristics and following up every single stent implanted during a PCI procedure. Indeed, during repeat angiography for any indication, the referring physician is informed by the Web interface on the number, characteristics, and localization of previously implanted stents. A report on the angiographic findings for each previously implanted stent(s) is mandatorily required at each repeat angiography. Clinical outcomes are obtained by tracking patients in SCAAR through other nationwide

Swedish registries using the personal identification number of each Swedish citizen as a link. This approach allows for the collection of a comprehensive, clinically mandated angiographic follow-up, and a complete administrative follow-up. The merging of registries was approved by the local ethics committee at Uppsala University.

Study devices

For this analysis, we stratified newer generation DES with at least 1000 implants into BP- and PP-DES groups. The BP-DES group included the Synergy (Boston Scientific Corporation, Marlborough, MA, USA), Orsiro (Biotronik AG, Bülach, Switzerland), and Ultimaster (Terumo Corporation, Tokyo, Japan) stent platforms. Characteristics of different BP-DES used in this study are shown in the [Supplementary material online, Table S1](#). The PP-DES group included: Xience Prime and Xience Xpedition (Abbott Vascular, Santa Clara, CA, USA); Promus Element, Promus Element Plus and Promus Premier (Boston Scientific, Natick, MA, USA); Resolute Integrity and Resolute Onyx (Medtronic Inc., Minneapolis, MN, USA).

To more broadly reflect the current clinical practice, the thick and non-contemporary Biomatrix stent (Biosensors Interventional Technologies Pte Ltd, Singapore) was excluded from the analysis. To avoid double counting of patients, only the first registered PCI procedure during the inclusion period was selected for the analysis. Also, patients implanted with a mixture of different stent types at the index procedure were excluded.

Outcomes and definitions

The primary outcomes of interest were the incidence of clinically relevant restenosis and definite ST up to 2 years. Secondary outcomes of interest were myocardial infarction (MI) and all-cause death.

Clinically relevant restenosis is defined in SCAAR as the angiographic evidence of significant ($>50\%$) in-stent restenosis or the presence of functional ischemia by FFR or iFR measurements with threshold values of 0.80 and 0.89, respectively. In keeping with the Academic Research Consortium, definite ST is defined as the presence of symptoms suggestive of an acute coronary syndrome and angiographic evidence of thrombus.¹³

Myocardial infarction was defined as a new hospitalization for acute MI after the index procedure (International Classification of Disease codes I21 and I22) which was registered in the nationwide Swedish Register of Information and Knowledge about Swedish Heart Intensive Care Admissions. Data on mortality were obtained by merging SCAAR with the National Population Registry. The method for obtaining follow-up information in this study is graphically displayed in the [Supplementary material online, Figure S1](#).

Statistical analysis

Continuous variables are reported as mean and standard deviation, while dichotomous variables are presented as frequencies and percentages. The effect size difference between the two stent groups for all the baseline clinical and procedural parameters was assessed using the standardized mean difference (SMD). Standardized mean difference values above 0.2 are indicative of potential imbalance between groups. Cumulative incidence curves and the rate of adverse events during follow-up were obtained using the Kaplan–Meier (KM) method. Patients who died were censored from the analysis of non-fatal events. The adjusted hazard ratio (HR) for each outcome of interest was calculated using a multivariable Cox proportional hazard regression model. Complex sampling was accounted in the models (i.e. hierarchical two-level clustering to account for multiple stents implanted in one patient and patients treated in the

Figure 1 A flow diagram of the study population. BP-DES, bioabsorbable polymer drug-eluting stents; n-DES, newer generation drug-eluting stent; PP-DES, permanent polymer drug-eluting stents.

same hospital). We used the propensity score (PS) technique to adjust for possible selection bias among the different stent groups. Two PS models for the stent- and patient-level analyses were developed using logistic regression. The list of variables included in each PS model is reported in the [Supplementary material online, Table S2](#). All models were then weighted by a function of the PS (inverse probability of treatment weighting using average treatment effect weights). An optimal balance for all covariates included in the PS models was achieved after weighting (SMD below 0.10 after weighting for all covariates). Post-dilatation, direct stenting, and the year of the index procedure were entered as additional covariates for adjustment in the final Cox models. The proportional hazard assumption was verified by visually inspecting the log-log plots. Since the rate of missing data was low in the data set, we proceeded with complete case analyses. The rate of missing information for each covariate, if any, is reported in the [Supplementary material online, Table S3](#). All analyses were conducted in R version 3.5.1 (R Foundation for Statistical Computing, Vienna, Austria).

Sensitivity and exploratory analyses

Since the inclusion of stents with different characteristics in the PP- and BP-DES is based on the assumption of a common class effect, we restricted the analysis to Promus-type DES (Promus Element, Promus Element Plus and Promus Premier) and Synergy which differ for the type of polymer (permanent vs. bioabsorbable, respectively) but have a similar metal platform (platinum chromium alloy), strut thickness, and antiproliferative drug (everolimus). We also investigated the univariate relationship between strut thickness and the risk of in-stent restenosis and ST.

Results

Clinical characteristics

A flowchart describing the selection of the study population is shown in [Figure 1](#). A total of 95 610 stents implanted in 57 487 procedures were included in the final analysis. The BP-DES group included 16 504 stents implanted in 10 032 procedures, while the PP-DES group encompassed 79 106 stents implanted in 47 455 procedures. The relative percentage of use over time for the individual stents is presented in [Figure 2](#). The cumulative number of different stents implanted in each group is reported in the [Supplementary material online, Table S4](#). Follow-up information at 2 years was almost complete for the entire study cohort (99.4% of patients).

The clinical and procedural characteristics of patients in the BP- and PP-DES groups are presented in [Tables 1 and 2](#), respectively. The mean age of the study population was 67.6 years and the majority of patients were male (73.7%). Diabetes mellitus was encountered in 21.2% of patients and three-vessel/left main disease was seen in 22.5% of patients. An acute coronary syndrome was the most frequent indication for PCI in the overall cohort. The number of patients implanted with BP-DES increased progressively throughout the study period.

There was no evidence of imbalance in the baseline clinical and procedural characteristics between the BP- and PP-DES groups (all SMD below 0.2). Covariates with SMD values ranging between 0.1

Figure 2 Proportional area graph showing the frequency of use for each individual stent platform during the study period. BP-DES, bioabsorbable polymer drug-eluting stents; PP-DES, permanent polymer drug-eluting stents.

and 0.2 were ticagrelor administration before PCI, more frequently seen in the BP-DES group, and clopidogrel and prasugrel administration during PCI which were more frequently encountered in the PP-DES group.

Stent thrombosis and restenosis

The KM curves for the incidence of definite ST and restenosis up to 2 years are shown in Figure 3A and B, respectively. For definite ST, the KM estimate was 0.48% and 0.66% in the BP- and PP-DES groups, respectively. The KM estimate for restenosis at 2 years was 1.2% and 1.4% in the BP- and PP-DES groups, respectively. There were no differences in the adjusted risk of definite ST and restenosis with BP-DES as compared to PP-DES [adjusted HR 0.79, 95% confidence interval (CI) 0.57–1.09; $P = 0.151$ and adjusted HR 0.95, 95% CI 0.74–1.21; $P = 0.670$, respectively]. Results for BP- vs. PP-DES were consistent when the models were further adjusted for strut thickness (adjusted HR for ST 0.85, 95% CI 0.59–1.22; $P = 0.369$ and adjusted HR for restenosis 1.08, 95% CI 0.81–1.43; $P = 0.616$, respectively).

Mortality and myocardial infarction

The KM curves for all-cause mortality and MI up to 2 years are shown in Figure 4A and B, respectively. There were no differences in the adjusted risk of all-cause death and MI between the two groups (adjusted HR for mortality 1.01, 95% CI 0.82–1.25; $P = 0.918$ and adjusted HR for MI 1.05, 95% CI 0.93–1.19; $P = 0.404$, respectively). The unadjusted and adjusted HRs for all the investigated outcomes are shown in Table 3.

Sensitivity and exploratory analyses

The KM curves of the sensitivity analysis comparing the angiographic outcomes of Promus and Synergy are showed in the [Supplementary material online, Appendix Figure S2](#). No differences in the rate of definite ST and restenosis at 2 years between the two stent types were found (unadjusted log-rank P -values >0.05). The univariate relationship between strut thickness and the risk of restenosis and ST is presented in the [Supplementary material online, Appendix Figure S3](#). A lower strut thickness was associated with improved stent performance.

Discussion

This study provides a comprehensive overview about the unrestricted use of newer generation DES in a large, nationwide, and unselected cohort of patients undergoing PCI. To our knowledge, this is also the largest population-based analysis looking at the comparative performance of BP- and PP-DES in the real world. The main findings of this study can be summarized, as follows: (i) in a real-life clinical scenario, the rate of stent failure with the use of newer generation DES was low at 2 years; (ii) the adjusted HR for in-stent restenosis and definite ST did not differ between BP- and PP-DES; and (iii) the adjusted risk for all-cause mortality and newer hospitalizations for MI was similar among patients receiving BP- or PP-DES at the time of the index procedure.

Bioabsorbable polymer drug-eluting stents have been developed with the goal of further improving the long-term outcomes after PCI.

Table 1 Clinical characteristics between the permanent polymer drug-eluting stents and bioabsorbable polymer drug-eluting stents groups

	PP-DES group (N = 47 455)	BP-DES group (N = 10 0032)	SMD
Age (years), mean (SD)	67.4 (10.9)	68.1 (10.9)	0.056
Male gender, n (%)	35 043 (73.8)	7321 (73.0)	0.020
Diabetes, n (%)	10 011 (21.2)	2195 (22.1)	0.022
Hypertension, n (%)	28 525 (60.8)	6253 (63.2)	0.050
Dyslipidaemia, n (%)	23 193 (49.5)	4735 (47.9)	0.032
Previous MI, n (%)	10 118 (21.7)	2147 (21.9)	0.007
Previous CABG, n (%)	4211 (8.9)	835 (8.3)	0.020
Previous PCI, n (%)	8957 (18.9)	1834 (18.3)	0.015
Smoking status, n (%)			0.014
Non-smoker	18 489 (40.8)	3938 (41.4)	
Ex-smoker (>1 month)	17 716 (39.1)	3715 (39.0)	
Current smoker	9091 (20.1)	1865 (19.6)	
BMI (kg/m ²), mean (SD)	27.5 (4.5)	27.5 (4.6)	0.002
ACS presentation, n (%)	37 215 (78.4)	7759 (77.3)	0.026
Unstable angina	4943 (10.4)	991 (9.9)	
NSTEMI	19 550 (41.2)	3948 (39.4)	
STEMI	12 722 (26.8)	2820 (28.1)	
Year of the index procedure, n (%)			1.065
2011	2189 (4.6)	39 (0.4)	
2012	9994 (21.1)	256 (2.6)	
2013	11 537 (24.3)	607 (6.1)	
2014	10 422 (22.0)	2596 (25.9)	
2015	8905 (18.8)	4198 (41.8)	
2016	4408 (9.3)	2336 (23.3)	
Medications before PCI, n (%)			
Aspirin	44 540 (93.9)	9486 (94.6)	0.029
Clopidogrel	16 141 (34.0)	3113 (31.0)	0.064
Ticagrelor	22 907 (48.3)	5575 (55.6)	0.147
Prasugrel	1195 (2.5)	124 (1.2)	0.095
Unfractionated heparin	6720 (14.2)	1618 (16.1)	0.055
Low molecular weight heparin	454 (1.0)	108 (1.1)	0.012
Chronic anticoagulation	1402 (3.0)	406 (4.0)	0.059

ACS, acute coronary syndrome; BMI, body mass index; CABG, coronary artery bypass grafting; MI, myocardial infarction; NSTEMI, non-ST-elevation myocardial infarction; PCI, percutaneous coronary intervention; SMD, standardized mean difference; STEMI, ST-elevation myocardial infarction.

Based on experimental models, reduced inflammation and more physiological endothelial healing processes are thought of as the principal biological mechanisms potentially subtending the benefits of BP-DES technology in the long term.⁶ However, this analysis from the large SCAAR registry failed to demonstrate a significant difference in the angiographic and clinical performance of BP- and modern PP-DES up to 2 years follow-up.

Our findings are consistent with the results of randomized clinical trials and meta-analyses comparing the outcomes of BP- vs. modern PP-DES. Indeed, while the superiority of BP-DES has been confirmed as compared to first generation DES and bare metal stents, no differences in clinical outcomes have been reported between BP- and other modern PP-DES.¹⁴ In a meta-analysis, encompassing 16 trials and 19 886 patients treated with second-generation DES, no differences in the risk of target vessel revascularization, cardiac death, MI, and definite/probable ST were seen between PP- and BP-DES.¹⁵

Interestingly, these results were consistent in several sensitivity analyses exploring the potential impact of different strut thickness, polymer resorption time, dual antiplatelet treatment duration, type of drug, and metallic platform of different stents included in the BP- and PP-DES groups.

With the similar goal of addressing the non-uniformity in the characteristics of different stents included in the BP- and PP-DES groups of our analysis, we conducted a sensitivity analysis restricted to Synergy and Promus-type DES which mostly differ for the type of polymer (bioabsorbable vs. permanent, respectively) but have similar additional structural features (e.g. metal alloy, rather similar strut thickness, antiproliferative drug). The results of this sensitivity analysis were largely consistent with the main analysis and did not show any differences in the rate of definite ST and restenosis between the two stent types at 2 years. These findings are consistent with the Evolution Stent System for the Treatment of a De Novo

Table 2 Procedural characteristics between the permanent polymer drug-eluting stents and bioabsorbable polymer drug-eluting stents groups

	PP-DES group (N = 47 455)	BP-DES group (N = 10 032)	SMD
Treated vessel			
Left main, n (%)	2356 (5.0)	472 (4.7)	0.012
Right coronary, n (%)	15 431 (32.5)	3377 (33.7)	0.024
Left anterior descending, n (%)	25 219 (53.1)	5193 (51.8)	0.027
Left circumflex, n (%)	13 525 (28.5)	2911 (29.0)	0.011
Arterial graft/bypass, n (%)	72 (0.2)	14 (0.1)	0.003
Vein graft, n (%)	1344 (2.8)	242 (2.4)	0.026
Total stent length, mean (SD)	34.06 (23.93)	35.68 (24.69)	0.066
Stent diameter, mean (SD)	2.99 (0.48)	2.98 (0.47)	0.025
Bifurcation, n (%)	8486 (17.9)	1821 (18.2)	0.007
Chronic occlusion, n (%)	2547 (5.4)	536 (5.3)	0.001
3VD/left main, n (%)	10 685 (22.5)	2276 (22.7)	0.004
Restenotic lesion, n (%)	2149 (4.5)	416 (4.1)	0.019
Multivessel PCI, n (%)	10 374 (21.9)	2204 (22.0)	0.003
Rotational atherectomy, n (%)	404 (0.9)	108 (1.1)	0.023
Direct stenting, n (%)	12 482 (26.3)	2246 (22.4)	0.091
Post-dilatation, n (%)	18 087 (38.1)	3897 (38.8)	0.015
Complete revascularization, n (%)	31 843 (67.9)	6788 (68.3)	0.010
Medications during PCI			
Aspirin, n (%)	2503 (5.3)	401 (4.0)	0.061
Clopidogrel, n (%)	2619 (5.5)	318 (3.2)	0.115
Ticagrelor, n (%)	5641 (11.9)	1086 (10.8)	0.034
Prasugrel, n (%)	659 (1.4)	19 (0.2)	0.136
GpIIb/IIIa inhibitors, n (%)	2346 (4.9)	304 (3.0)	0.098
Unfractionated heparin, n (%)	39 346 (82.9)	8678 (86.5)	0.100
Low molecular weight heparin, n (%)	1646 (3.5)	259 (2.6)	0.052
Bivalirudin, n (%)	12 977 (27.3)	2322 (23.2)	0.097

3VD, three-vessel disease; GP IIb/IIIa, glycoprotein IIb/IIIa inhibitors; SMD, standardized mean difference.

Atherosclerotic Lesion (EVOLVE) trial which demonstrated the non-inferiority of Synergy vs. Promus Element for clinical and angiographic outcomes up to 5 years.^{8,16}

In our opinion, the iteration process of PP-DES leading to the current high standards of clinical performance for this technology, largely accounts for the lack of incremental benefit when BP-DES or other devices are used as comparators. Nowadays, PP-DES are characterized by enhanced biocompatibility of polymers, as well as, reduced strut thickness.¹ These features have contributed to preserving the antirestenotic efficacy seen with the first PP-DES generation while decreasing the risk of late and very late ST. As a mechanistic insight for the similarity in clinical outcomes, intravascular imaging data obtained by serial optical coherence tomography assessments did not show differences in the early healing process and long-term vascular response between thin-strut BP- and PP-DES.¹⁷

Another possible explanation for the lack of incremental benefit with BP- over PP-DES in this analysis is the relatively limited duration of follow-up (e.g. 2 years) which, also, is in temporal overlap with the polymer degradation process in one of the platforms included in the BP-DES group. The long term, when the polymer resorption process has been fully completed, could represent the optimal time window

wherein the benefits with the use of BP-DES might emerge. However, the late catch-up in stent failure incidence with modern PP-DES has been demonstrated to be low.¹² As such, a technology that is expected to improve the long-term outcomes of modern PCI faces the hurdle of an already well-performing technology over time. A meta-analysis of randomized clinical trials looking at the long-term outcomes after DES implantation (3–5 years after PCI) did not identify any differences in the risk of cardiac mortality, ST, target lesion revascularization, target vessel failure and Re-infarction between BP- and PP-DES.¹⁸ Recently, the long-term follow-up data from the ISAR-TEST 4 (Intracoronary Stenting and Angiographic Results: Test Efficacy of 3 Limus-Eluting Stents) trial did not show differences in clinical outcomes among patients treated with BP- or PP-DES up to 10 years.¹⁹

The low rates of definite ST and restenosis in this study are remarkable and further corroborate the excellent safety performance of newer generation DES. There is emerging evidence that the use of DES with ultrathin strut thickness (<70 μm) has the potential to further improve the clinical outcomes of patients undergoing PCI.^{20,21} In exploratory univariate analyses, we were able to identify signals of improved stent performance related to a progressive reduction of strut thickness. These findings should be cautiously interpreted since

Figure 3 Cumulative incidence curves for definite stent thrombosis (A) and restenosis (B).

Figure 4 Cumulative incidence curves for all-cause death (A) and myocardial infarction (B).

potential confounding was not addressed, but certainly are interesting and require future specific investigation.

Limitations

There are different limitations to this analysis that should be carefully considered. First, this was a non-randomized study and, even if we attempted to minimize the risk of bias in adjusted analyses, residual confounding might still be present. Notwithstanding, common clinical practice suggests a low risk for selection bias by PCI operators for BP- or PP-DES implantation as also reflected by the very similar background demographics between the two stent groups. Second, we hypothesized the existence of a class effect for different stent platforms included in the BP- and PP-DES groups, and the Synergy stent

was numerically dominant in the BP-DES group. Moreover, all BP-DES in this study had a lower strut thickness as compared to PP-DES. In a sensitivity analysis, however, the results were consistent with the main analysis when BP- and PP-DES with similar structural characteristics were compared. Third, we were not able to classify different causes of death (i.e., cardiac vs. non-cardiac) and the definition of ST did not include probable events. Fourth, even if dual antiplatelet therapy was recommended for six to twelve months in patients with stable coronary artery disease and for twelve months in patients who suffered from an acute coronary syndrome,²² important information concerning the adherence to treatment, as well as, the use of other secondary preventive measures was not collected in the registry.

Conclusions

In a large, nationwide and unselected cohort of patients undergoing PCI for different clinical indications, BP-DES use was not associated with an incremental clinical benefit over PP-DES implantation at 2 years follow-up.

Supplementary material

Supplementary material is available at *European Heart Journal* online.

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Table 3 Unadjusted and adjusted hazard ratio estimates for bioabsorbable polymer drug-eluting stents vs. permanent polymer drug-eluting stents

Endpoints	Unadjusted model			Adjusted model ^a		
	HR	95% CI	P-value	HR	95% CI	P-value
Restenosis	0.86	0.71–1.05	0.132	0.95	0.74–1.21	0.670
Stent thrombosis	0.72	0.53–0.96	0.028	0.79	0.57–1.09	0.151
All-cause death	1.16	1.07–1.26	<0.001	1.01	0.82–1.25	0.918
Myocardial infarction	1.00	0.91–1.10	0.952	1.05	0.93–1.19	0.404

Unadjusted model account only for clustering of multiple stents in the same patient.
BP, bioabsorbable polymer; CI, confidence interval; DES, drug-eluting stents; HR, hazard ratio; PP, permanent polymer.
^aModel accounting for multilevel clustering of data and adjusted using propensity score weighting, post-dilation, direct stenting, and year of the index procedure.

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