Published in final edited form as:

Am J Cardiol. 2012 January 15; 109(2): 195–201. doi:10.1016/j.amjcard.2011.08.028.

Comparison in Three Age Groups Regarding the Safety and Efficacy of Drug-Eluting Stents (From the National Heart, Lung and Blood Institute Dynamic Registry)

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Abstract

Limited data exist regarding DES versus BMS use in older patients. From the NHLBI Dynamic Registry 5089 percutaneous coronary intervention (PCI) treated patients were studied (October 2001–August 2006). Differences in one-year safety (death, myocardial infarction [MI] and their composite) and efficacy (target vessel revascularization [TVR] with PCI and repeat revascularization) outcomes were compared between patients who received DES versus BMS within each age group: <65 years (n=2680); 65–79 years (n= 1942); ≥80 years (n=443). There were no differences in safety outcomes by stent type in any age group at one-year. As for effectiveness, lower rates of TVR with PCI and repeat revascularization were observed in DES patients across all age groups. After propensity adjusted analysis, the risk of TVR with PCI and repeat revascularization favored DES versus BMS with patients < 65 years (7.4% vs. 14.6%; HR=0.44; 95% CI 0.32–0.60, 12.3% vs. 17.4%; HR=0.65; 95% CI 0.51–0.84) 65–79 years (4.8% vs. 9.5%; HR=0.50; 95% CI 0.31–0.80, 7.6% vs. 12.3%; HR=0.62; 95% CI 0.44–0.88) and ≥ 80 years (4.5% vs. 10.4%; HR=0.15; 95% CI 0.05–0.44, 6.0% vs. 14.5%, HR=0.18, 95% CI 0.08–0.40). In conclusion, significant reductions in TVR with PCI and repeat revascularization were noted in all three age groups without increases in death or MI in this large multi-center PCI registry. Our data support the use of DES regardless of age.

Keywords

Drug-eluting stents; elderly; age; clinical outcomes

INTRODUCTION

To date, limited studies exist regarding percutaneous coronary intervention (PCI) in the older patient population. The majority of randomized studies exclude these patients due to co-morbid conditions and heightened cardiovascular risk. Among the observational studies confined to drug-eluting stents (DES) and stratified by age, variable benefit was noted in older patients¹⁻⁴. Of the 2 studies comparing DES to bare metal stents (BMS) in older patients, improved survival was seen with DES^{5,6}. Although provocative, these results are discordant with our knowledge of DES outcomes and deserve confirmation⁷⁻¹⁰.

Accordingly, using the National Heart, Lung, and Blood Institute (NHLBI) sponsored Dynamic Registry, we evaluated the impact of age on the safety and efficacy of DES versus BMS in consecutive patients undergoing PCI.

METHODS

The methodologies and characteristics of the Dynamic Registry have been previously described¹¹. In brief, this is a multi-center North American registry of consecutive patients undergoing PCI. There were five recruitment waves with approximately 2,000 patients enrolled in each wave across 27 clinical centers. The present analysis was restricted to the most contemporary three waves and all patients received at least one stent. The BMS patients were drawn from Wave 3 (2001; total n=2047, BMS n=1763) and the DES patients were recruited from Waves 4 (2004; total n=2112, DES n=1459) and 5 (2006; total n=2177, DES n=1867). There was a notable large selection bias in stent type (DES and BMS) in Waves 4 and 5 with the 'sicker' patients (i.e. cardiogenic shock) tending to be given BMS. To minimize confounding of results, patients in Waves 4 and 5 who received BMS were excluded (n=712).

Baseline, procedural and in-hospital outcome data were collected from the 5089 PCI treated patients included in this study. Patients were arbitrarily divided into three age strata: (1) <65 years; (2) 65–79 years; and (3) ≥80 years. Thereafter, each age category was sub-divided into patients who received either BMS or DES. Within each age category, the BMS and DES groups were compared for patient demographics, angiographic and lesion characteristics, patient-specific procedural data and outcomes, and treatment strategy/device use. All patients were contacted at 30-days, 6-months, and 1 year post-PCI to assess vital status, clinical symptoms, coronary events and cardiac hospitalizations. Informed consent was obtained. The research protocol was approved by the institutional review boards at clinical sites as well as the University of Pittsburgh data coordinating center (Pittsburgh, Pennsylvania).

Safety outcomes included death and myocardial infarction (MI). Death was defined as all-cause mortality. MI was defined as ≥ 1 of the 2 criteria: (1) evolutionary ST-segment elevation, new Q waves on 2 contiguous electrocardiogram leads, or new left bundle branch block, (2) elevated cardiac biomarkers reflecting myocardial necrosis such as (a) CK-MB ≥ 3 times the upper limit of normal, (b) total CK ≥ 3 times the upper limit of normal (only if CK-MB is not available), or an elevated troponin greater than the upper limit of normal.

Efficacy outcomes included target vessel revascularization (TVR) and repeat revascularization. Patient and lesion level data was collected on patients undergoing any repeat PCI during follow-up although vessel information was not collected on patients undergoing coronary artery bypass graft (CABG) surgery. TVR was defined as revascularization somewhere along the length of the index treated vessel within the follow-up period via PCI. Repeat revascularization was defined as having either CABG or PCI within the follow-up period.

A stratified analysis was performed to examine the association between stent type and age groups. Within each age strata, patient characteristics including demographics, medical history, cardiac presentation, peri-procedural medications, procedural characteristics, and in-hospital outcomes were compared between stent types by student *t*-tests or Wilcoxon non-parametric tests for continuous variables and chi-square test or Fisher's Exact test for categorical variables. Similar methods were used for lesion-level analyses. One-year event rates were calculated using the Kaplan-Meier method and unadjusted comparisons of survival curves were performed using the log-rank test. Patients who did not experience the outcome of interest were censored at the last known date of contact or at 1 year if contact extended beyond 1 year.

Cox proportional hazards modeling was used to estimate: one-year hazard ratios for adverse clinical events in relation to stent type for each strata. A propensity score approach was used to balance factors associated with the nonrandom assignment of treatment time (earlier recruitment Wave versus later recruitment Wave) using SAS. Logistic regression was used initially to identify the variables to include in each propensity score (one for <65 years, one for 65–79 years, and one for ≥80 years). The models were conservative, such that it included variables with a *p*-value <0.40. A probability score was created for each study participant using parameter estimates for the variables in the model. The score as a continuous variable was then included in outcome models. The score was also evaluated as quartiles but the results were similar. The following demographic, angiographic, and procedural characteristics were considered: age, race, sex, body mass index, prior PCI, prior CABG, prior MI, diabetes mellitus, co-morbid conditions such as hypertension, dyslipidemia, congestive heart failure, chronic kidney disease, peripheral vascular disease, obstructive pulmonary disease and cancer, lumen irregularities, vessel disease, reason and urgency for revascularization, cardiogenic shock, procedural medications including thrombolytics, IIb/IIIa inhibitors, and thienopyridines, and characteristics such as evidence of thrombus, ulcerations, presence of calcium, tortuosity, lesion classification (type C), lesion location, number of significant lesions, as well as the individual *off-label* characteristics (e.g., for a restenotic lesion, a lesion in a bypass graft, a lesion length > 30 mm, or a reference-vessel diameter <2.5 mm or >3.75 mm). The *c*-statistic for the models by age strata was 0.75, 0.75 and 0.81 respectively. Covariate balance between DES and BMS patients in each age strata was assessed after adjustment for the propensity score as a continuous covariate using logistic regression. Given the temporal change in prescribing patterns from the BMS to the DES era, all outcomes were adjusted for pre-specified medications considered to be standard medical therapy (cholesterol modifying agents, beta blockers, angiotensin converting enzyme inhibitors or angiotensin receptor blockers, aspirin, and thienopyridines). Proportional hazards assumptions were evaluated and met. A two-sided *p* <0.05 was considered statistically significant.

RESULTS

The age range for the 5089 included patients was 25 to 95 years old. As seen in Table 1, patients <65 years receiving DES compared to BMS were more likely to be non-white, present with a higher prevalence of cardiovascular risk factors and were more likely to have undergone a prior PCI but less likely to have congestive heart failure (CHF) during hospitalization. There were significant differences in the primary indication for revascularization with fewer patients presenting with an acute MI and more presenting with asymptomatic CAD or other reasons with DES. The patients 65–79 years with DES were less commonly female but had higher prevalence of diabetes and dyslipidemia and more commonly had undergone a prior revascularization procedure with PCI. The frequency of prior/in-hospital CHF were lower in those treated with DES but renal disease was more prevalent. There was a shift in the primary revascularization indication by stent type with

higher rates of DES in stable angina pectoris and asymptomatic CAD. There were few significant differences by stent type among the patients ≥ 80 years although those treated with DES were more likely to be dyslipidemic and to have hypertension ($p=0.06$). Similar to the other age groups, the primary indication for revascularization showed a higher percentage of patients treated for stable angina and asymptomatic CAD among the DES patients with fewer patients undergoing revascularization for unstable angina ($p=0.08$).

In Table 2, the attempted lesions of patients <65 years who received DES compared to BMS were significantly more likely to be American College of Cardiology/American Heart Association (ACC/AHA) type C lesions, calcified, and longer in length but less commonly located in a bifurcation. The attempted lesions of patients 65–79 years treated with DES were more commonly ACC/AHA type C lesions, showed evidence of calcification, and longer in length, however, were less likely to be thrombotic or located in a bifurcation. Among the attempted lesions of the patients ≥ 80 years treated with DES, the frequency of calcification was significantly greater compared to BMS patients and the mean lesion length was significantly longer. While there was less evidence of thrombus formation in the treated lesions implanted with DES, the percent of ACC/AHA type C lesions were marginally significant ($p=0.08$).

As is seen in Table 3, patients <65 years who received DES compared to BMS tended to undergo elective procedures, presented or developed cardiogenic shock less often, and were less likely to receive glycoprotein IIB/IIIA inhibitor during the procedure. Despite fewer lesions undergoing treatment among DES patients, more multi-vessel interventions were performed. Similarly, patients 65–79 years with DES underwent elective procedures more often and were less likely to be in cardiogenic shock or receive glycoprotein IIB/IIIA inhibitors. A higher proportion of multi-vessel PCI interventions were performed and they were more likely to achieve angiographic success immediately post procedure with DES. As for the patients ≥ 80 years, those treated with DES were much less likely to undergo urgent or emergency procedures and to receive a glycoprotein IIB/IIIA inhibitor peri-procedurally. While a numerically higher frequency of multi-vessel interventions were performed, statistical significance was not reached.

Unadjusted in-hospital outcomes were compared in each age strata according to DES versus BMS. In patients <65 years, death (0.4% vs. 0.3% $p=1.0$), MI (1.4% vs. 1.6%, $p=0.81$) and death/MI (1.8% vs. 1.9%, $p=0.91$) were similar. As well, patients 65–79 years had comparable rates of death (0.6% vs. 1.1%, $p=0.16$), MI (2.7% vs. 2.3%, $p=0.61$) and death/MI (3.1% vs. 3.3%, $p=0.80$). In the patients ≥ 80 years, the incidence of death was significantly lower with DES (0.4% vs. 4.9%, $p=0.002$), MI was similar (2.5% vs. 2.5%, $p=1.0$) and the composite of death and MI was significantly lower with DES (2.5% vs. 7.4%, $p=0.01$).

One year after treatment, unadjusted safety and efficacy outcomes were compared among patients with DES versus BMS stents for each age category. In terms of safety, patients <65 years had similar rates of death (1.5% vs. 1.9%, $p=0.53$), MI (4.0% vs. 3.7%, $p=0.75$) and death/MI (5.2% vs. 5.6%, $p=0.77$). Efficacy outcomes were significantly lower as depicted by lower rates of TVR with PCI (5.9% vs. 12.1%, $p<0.001$) and repeat revascularization (12.3% vs. 17.4%, $p<0.001$). As well, patients 65–79 years had similar cumulative incidence rates of death (4.6% vs. 5.4%, $p=0.44$), MI (5.1% vs. 5.7%, $p=0.64$) and the composite of death/MI (8.8% vs. 10.5%, $p=0.26$) by stent type. One-year incidence rates of TVR with PCI (3.8% vs. 7.1%, $p=0.002$) and repeat revascularization (7.6% vs. 12.3%, $p<0.001$) were significantly lower among DES patients. Event rates observed among patients ≥ 80 years were similar for the safety outcomes of death (11.2% vs. 12.2%, $p=0.61$), MI (5.2% vs. 6.5%, $p=0.57$) and death/MI (15.1% vs. 17.7%, $p=0.38$) with lower need for TVR with PCI

(3.1% vs. 8.3%, $p=0.02$) and repeat revascularization (6.0% vs. 14.5%, $p=0.004$). Kaplan-Meier curves are shown in Figure 1.

Figure 2 demonstrates the propensity score adjusted analysis of clinical outcomes according to DES stratified by age category. The use of the propensity score as a covariate balanced the DES and BMS patients (data not shown). The adjusted risk of death/MI was similar over one-year in patients who received DES versus BMS in patients <65 years (HR 1.05: 95% CI 0.70–1.58), 65–79 years (HR 0.96: 95% CI 0.68–1.37) and ≥ 80 years (HR 0.82: 95% CI 0.44–1.53). The risk in the need for TVR with PCI were significantly lower in patients receiving DES compared to BMS in all three age groups. The relative risk reduction for repeat revascularization procedures during one year of follow-up was 35%, 38% and 82% for respective age groups.

Stent thrombosis (ST) was only collected in Waves 4 and 5 (adjudicated). One-year definite ST among DES were as follows: <65 years=1.2%, 65–79 years=0.33%, and ≥ 80 years=1.1%.

DISCUSSION

The results of our study confirm the long-term safety of PCI using DES with similar rates of death or MI at 1 year. We also provide further support for clinical benefit of PCI with DES in reducing the need for repeat PCI and repeat revascularization within 1 year, with new insights into the outcomes of DES patients by age group. The use of DES in older patients appears safe with similar death/MI rates yet efficacy is markedly enhanced with low rates of TVR and repeat revascularization at 1 year. Our results support the use of DES in older patients.

Benefits of revascularization with PCI over medical therapy in older patients has been widely established. In the randomized TIME study, patients > 75 years had better symptom relief and quality of life at 6 months with PCI¹². In the APPROACH registry, patients ≥ 80 years with PCI had higher 4-year survival rates (71.6%) compared to medical therapy alone (60.3%)¹³. As such, PCI has become common amongst older patients with low in-hospital mortality rates¹⁴. Yet, no randomized studies comparing DES to BMS in older patients have been reported. Recently, a retrospective cohort of Medicare patients older than 65 years who received DES compared to BMS controls report lower 1 year mortality rates (6.6% versus 8.9%, $p<0.001$) and 1 year subsequent MI (7.2% versus 9.3%) with DES⁶. Similarly, the comparative effectiveness of DES relative to BMS was evaluated using the American College of Cardiology-National Cardiovascular Data Registry in patients 65 years or older. At 30 months, patients receiving DES had lower rates of death (13.5% versus 16.5%, $p<0.001$) and MI (7.5 of 100 patients versus 8.9 of 100 patients, $p<0.001$) compared to BMS⁵. After adjusting for a propensity score, our data reflect no difference in death or MI at 1 year irrespective of age. The difference in death or MI reported in prior registry studies may be due to the possibility that ‘sicker’ patients were preferentially selected for BMS (despite statistical adjustment). In our study, we intentionally excluded BMS patients enrolled in Waves 4 and 5 (DES patients were selected) to minimize confounding results due to a stent selection bias. As well, our results support prior pooled analyses of several randomized trials^{7–10} and observational studies^{10,15,16} showing similar incidence of death or MI in DES compared to BMS patients.

Worthy of note are the low rates of TVR and repeat revascularization with DES in older patients. Comparable 1 year TVR rates have been reported in octogenarians implanted with DES (4.4%)¹⁷. Groeneveld et al report similar trends in 1 year repeat revascularization rates of 12.6% with DES compared to 14.6% with BMS in patients 65 year or older ($p<0.001$)⁶.

Our results suggest the greatest benefit of DES was seen in the patients ≥ 80 years although our observation may be limited by the number of elderly patients (with wide confidence intervals). Perhaps, accelerated rates of neointimal hyperplasia occur in older patients due to excessive co-morbidities with complex coronary disease driving rates of repeat revascularization. De Gregorio et al report higher angiographic restenosis rates in older compared to younger patients (47% versus 28%, $p < 0.001$) with BMS¹⁸. Reports from the German Cypher Stent Registry found target vessel revascularization rates of 7.3% in older compared to 8.7% in younger patients ($p < 0.05$)¹. Thus, the clinical implications and anti-proliferative effects of DES may prove greatest in this particular subset of high-risk patients.

Although the design of our study did not allow for direct comparisons between age strata, it is important to note higher mortality rates with age. Prior data in older patients undergoing PCI found a 2–4 fold higher risk compared to younger patients¹⁹. Our data support these findings with 3-fold death/MI rates in patients ≥ 80 years compared to younger patients. Largely these results are due to the influence of co morbidities related to age. Using similar data from the NHLBI dynamic registry, Cohen et al found the relative magnitude of excess mortality in the older PCI patients were comparable to similar aged groups in the general US population²⁰.

There are some limitations to our study. Our results were based on an observational registry. Although we adjusted for several variables using a propensity score adjusted analysis, confounding due to unmeasured factors cannot be excluded. As well, the DES group was compared to historic BMS controls which were treated a few years earlier. DES patients could have benefited from improvements in PCI technique or adjunctive medical therapy for coronary artery disease (despite our attempts for adjustment). Yet, procedural (angiographic) success was similar with historical controls and contemporary use of DES. We felt historical controls were reasonable since contemporary use of BMS was more commonly used in patients with adverse events (i.e. cardiogenic shock). Finally, although in-hospital medication use was accounted for in the adjusted analysis, long-term use was not completely collected.

Acknowledgments

This study was supported in part by grant HL033292 from the National Heart, Lung, and Blood Institute, Bethesda, MD. There are no relationships with industry.

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One-year cumulative death or myocardial infarction rates by stent type and age groups

Figure 1A

One-year cumulative TVR rates by stent type and age groups

Figure 1B

One-year cumulative repeat revascularization rates by stent type and age groups

Figure 1C

Figure 1.

Unadjusted kaplan-meier curves for 1 year clinical outcomes according to stent type (drug-eluting versus bare metal) and age tertile

Figure 2.
Propensity adjusted analysis for 1 year clinical outcomes by stent type (drug-eluting versus bare metal) and age tertile

Table 1

Demographic and clinical characteristics

Characteristic	Age Groups (Years)					
	< 65 (n=2697)		65-79 (n=1947)		≥80 (n=445)	
	BMS (n=897)	DES (n=1800)	BMS (n=704)	DES (n=1243)	BMS (n=162)	DES (n=283)
Female	28.0%	26.7%	43.9%	37.7% [†]	43.8%	47.3%
Ethnic Group						
White	76.7%	71.5% [‡]	81.7%	78.6%	88.9%	85.9%
Black	15.2%	18.1%	10.4%	13.4%	6.8%	10.6%
Asian	3.6%	3.6%	3.1%	2.4%	3.1%	1.4%
Hispanic	4.3%	6.4%	4.8%	5.4%	1.2%	1.8%
Other	0.2%	0.4%	0.0%	0.2%	0.0%	0.4%
Current smoker	37.1%	35.6%	12.7%	10.7%	4.2%	4.3%
Diabetes mellitus	27.3%	34.4% [*]	32.9%	37.8% [‡]	22.8%	23.7%
Hypertension	68.4%	73.7% [†]	80.1%	83.6%	79.5%	86.2%
Hypercholesterolemia	70.5%	76.1% [†]	71.3%	82.4% [*]	58.8%	76.4% [*]
Prior coronary stent	18.7%	29.8% [*]	19.7%	28.1% [*]	19.1%	21.6%
Prior Coronary bypass	12.7%	12.4%	23.0%	26.0%	18.5%	24.7%
Prior myocardial infarction	24.5%	23.5%	28.4%	25.7%	26.1%	24.6%
Heart failure (history)	8.2%	6.4%	17.1%	13.0% [‡]	18.7%	17.2%
Heart failure during hospitalization	5.7%	4.0% [‡]	11.2%	8.3% [‡]	10.6%	12.4%
Mean ejection fraction	52.4%	53.1%	50.4%	51.9%	51.3%	51.6%
Number of narrowed coronary arteries:						
1	42.9%	41.2%	32.5%	28.6%	30.2%	24.4%
2	32.3%	33.0%	31.8%	33.1%	30.9%	31.1%
3	24.6%	25.6%	35.4%	38.1%	37.7%	44.5%
Primary Indication						
Myocardial infarction	34.8%	29.3% [*]	23.7%	22.5% [*]	28.4%	26.1%
Unstable angina pectoris	34.6%	34.8%	45.5%	33.7%	45.1%	34.6%
Stable angina pectoris	22.2%	19.3%	17.9%	25.0%	13.6%	19.8%

Characteristic	Age Groups (Years)					
	<65 (n=2697)		65-79 (n=1947)		≥80 (n=445)	
	BMS (n=897)	DES (n=1800)	BMS (n=704)	DES (n=1243)	BMS (n=162)	DES (n=283)
Asymptomatic coronary disease	7.3%	12.2%	9.7%	13.6%	10.5%	13.8%
Other	1.1%	4.4%	3.3%	5.1%	2.5%	5.7%
Non-cardiac co morbid disease						
Cerebrovascular	4.4%	4.7%	8.5%	10.7%	11.1%	12.8%
Renal	5.0%	6.6%	8.4%	11.5% [‡]	13.0%	13.9%
Peripheral disease	6.0%	5.6%	12.5%	11.4%	13.0%	13.5%
Pulmonary	6.7%	6.9%	11.0%	9.6%	9.3%	8.5%
Cancer	3.7%	3.5%	11.0%	11.3%	13.6%	14.2%

[‡] p≤0.05

[†] p≤0.01

* p≤0.0001

Table 2

Attempted Lesion characteristics

Characteristic	Age Group (Years)					
	< 65 (n=3715)	65–79 (n=2794)	≥80 (n=636)	< 65 (n=3715)	65–79 (n=2794)	≥80 (n=636)
	BMS (n=1281)	DES (n=2434)	BMS (n=1026)	DES (n=1768)	BMS (n=244)	DES (n=392)
Target Lesion coronary artery						
Left main	0.8%	1.0% [‡]	1.8%	1.9%	1.6%	2.3%
Left anterior descending	37.1%	39.8%	32.7%	34.4%	37.7%	38.8%
Left circumflex	21.4%	24.1%	24.6%	24.9%	20.1%	21.7%
Right	36.1%	31.4%	32.5%	29.9%	30.7%	29.8%
Bypass graft	4.6%	3.7%	8.5%	8.8%	9.8%	7.4%
ACC/AHA Classification						
A	18.7%	12.4% [*]	14.7%	9.6% [*]	14.1%	9.5%
B1	36.8%	34.6%	32.9%	31.0%	29.1%	26.4%
B2	28.6%	28.6%	32.7%	32.3%	35.5%	34.6%
C	16.0%	24.5%	19.8%	27.0%	21.4%	29.5%
Ostial lesion	5.9%	7.2%	7.9%	9.8%	8.7%	9.7%
Calcified	14.3%	23.5% [*]	29.0%	34.7% [‡]	35.7%	46.2% [‡]
Bifurcation	12.8%	9.8% [‡]	13.6%	8.3% [*]	13.9%	9.7%
Evidence of thrombus	17.6%	15.4%	13.0%	10.4% [‡]	14.1%	9.0% [‡]
Chronic total occlusion	11.6%	10.2%	7.1%	7.0%	5.3%	6.4%
Mean lesion length (mm)	13.7	16.9 [*]	13.1	16.7 [*]	13.0	16.4 [*]
Mean reference-vessel size (mm)	3.1	3.0	3.1	3.0	3.0	2.9
Mean diameter stenosis	83.1%	83.6%	82.3%	83.2%	84.1%	83.2%

[‡] p≤0.05[‡] p≤0.01^{*} p≤0.001

Table 3

Procedural characteristics

Characteristic	Age Group (Years)					
	< 65 (n=2697)		65–79 (n=1947)		≥80 (n=445)	
	BMS (n=897)	DES (n=1800)	BMS (n=704)	DES (n=1243)	BMS (n=162)	DES (n=283)
Circumstances of the procedure						
Elective	50.9%	54.9% [‡]	50.1%	61.5% [*]	32.1%	58.7% [*]
Urgent	36.8%	31.4%	42.0%	31.0%	53.1%	34.6%
Emergent	12.3%	13.7%	7.8%	7.6%	14.8%	6.7%
Cardiogenic Shock	2.3%	0.9% [‡]	1.7%	0.7% [‡]	2.5%	0.7%
Glycoprotein inhibitors	58.1%	40.1% [*]	53.0%	33.8% [*]	51.9%	25.4% [*]
Number of lesions attempted						
1	68.3%	72.1% [‡]	65.6%	67.3%	63.6%	69.6%
2	23.2%	22.1%	25.9%	25.5%	27.2%	23.7%
≥3	8.5%	5.9%	8.5%	7.2%	9.3%	6.7%
Number of vessels attempted						
1	88.8%	85.4% [‡]	88.2%	81.8% [*]	84.6%	82.0%
2	10.6%	13.4%	10.6%	17.3%	14.8%	17.0%
3	0.6%	1.2%	1.1%	0.9%	0.6%	1.0%
Type of drug-eluting stent						
Sirolimus	--	66.3%	--	65.9%	--	64.7%
Pacitaxel	--	35.0%	--	37.1%	--	38.9%
Other	--	0.9%	--	0.3%	--	0.3%
Angiographic success (%)	97.2%	97.8%	95.4%	97.7% [‡]	96.9%	97.2%

[‡] p≤0.05[‡] p≤0.01^{*} p≤0.001