Paclitaxel-Eluting Versus Sirolimus-Eluting Stents in Diabetes Mellitus

A Report From the National Heart, Lung, and Blood Institute Dynamic Registry

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Background—Diabetes is a powerful predictor of adverse events in patients undergoing percutaneous coronary intervention. Drug-eluting stents reduce restenosis rates compared with bare metal stents; however, controversy remains regarding which drug-eluting stents provides greater benefit in patients with diabetes. Accordingly, we compared the safety and efficacy of sirolimus-eluting stents (SES) with paclitaxel-eluting stents (PES) among diabetic patients in a contemporary registry.

Methods and Results—Using the National Heart, Lung, and Blood Institute Dynamic Registry, we evaluated 2-year outcomes of diabetic patients undergoing percutaneous coronary interventions with SES (n=677) and PES (n=328). Clinical and demographic characteristics, including age, body mass index, insulin use, left ventricular function, and aspirin/clopidogrel use postprocedure, did not differ significantly between the groups except that PES-treated patients had a greater frequency of hypertension and hyperlipidemia. At the 2-year follow-up, no significant differences were observed between PES and SES with regard to safety or efficacy endpoints. PES- and SES-treated patients had similar rates of death (10.7% versus 8.2%, P=0.20), death and myocardial infarction (14.9% versus 13.6%, P=0.55), repeat revascularization (14.8% versus 17.8%, P=0.36), and stent thrombosis (1.3% versus 1.3%, P=0.95). After adjustment, no significant differences between the 2 stent types in any outcome were observed.

Conclusions—PES and SES are equally efficacious and have similar safety profiles in diabetic patients undergoing percutaneous coronary interventions in clinical practice. (Circ Cardiovasc Interv. 2010;3:42-49.)

Key Words: diabetes mellitus ■ insulin ■ stents ■ revascularization ■ coronary disease

Diabetes mellitus is a significant risk factor for coronary artery disease and a powerful predictor of adverse events in patients undergoing percutaneous coronary interventions (PCI).1—3 Compared with patients without diabetes, those with diabetes have increased rates of restenosis, subacute stent thrombosis, and progression of coronary artery disease, resulting in poorer short- and long-term event-free survival.4—7 Despite these disadvantages, the use of coronary artery stenting in treating patients with diabetes is widespread and growing.

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The use of drug-eluting stents (DES) in PCI has improved outcomes in the treatment of coronary artery disease, across many patient populations, including those with diabetes. DES reduce restenosis rates in this high-risk patient subset compared with bare-metal stents (BMS).8,9 We and others have previously shown that, compared with bare-metal stents, DES are safe and more efficacious. The use of DES in treating diabetic patients is associated with a lower risk for repeat revascularization without any increase in death or myocardial infarction (MI).10

Currently, there are 4 different DES available in the United States, and because they were the first 2 Food and Drug Administration–approved DES, the sirolimus-eluting stents (SES) and paclitaxel-eluting stents (PES) have been implanted in the greatest number of patients. Recent reports have commented on the relative benefit of SES and PES in...
patients with diabetes mellitus. These studies have resulted in ongoing controversy regarding which DES may provide greater benefit among diabetic patients, both from a safety and an efficacy perspective. Some of the clinical studies have suggested that SES may have benefits over PES in patients with diabetes, whereas other studies have shown no significant difference between the 2 DES. Furthermore, based on its mechanism of action, PES may have an advantage in this population. Overall, there are limited short- and long-term data with respect to direct comparisons of PES and SES in patients with diabetes mellitus. Only 3 randomized controlled trials have directly compared the 2 DES in diabetic patients. These studies had relatively small sample sizes, short follow-up, and primarily angiographic, not clinical, end points. Accordingly, using the NHLBI Dynamic Registry, we sought to compare the safety and efficacy of SES and PES in diabetic patients undergoing PCI.

**Methods**

**NHLBI Registry Design**

The Dynamic Registry, coordinated at the University of Pittsburgh, includes 23 sites across North America that enrolled sequential patients undergoing PCI at several periods of time or “waves.” The first wave (July 1997 to February 1998) enrolled 2524 patients. The second wave (February 1999 to June 1999) enrolled 2105 patients. In the third wave (October 2001 to March 2002), 2047 patients were enrolled. The fourth wave (February 2004 to May 2004) enrolled 2112 patients and the fifth wave (February 2006 to August 2006) enrolled 2177 patients.

Full details on the methods of data collection, quality assurance, and definition of terms have been previously described. By design, the cohorts from each wave were enriched with an oversampling of women and minorities. Enrollment began after approval of each site’s Institutional Review Board. On enrollment into the registry, all patients signed informed consent to allow for data collection and follow-up.

Baseline demographic, clinical, angiographic, and procedural characteristics during the index PCI were collected. In addition, the incidence of death, MI, stent thrombosis, repeat PCI, and the need for coronary artery bypass grafting (CABG) was recorded. In-hospital, 1-, 6-, 12-, and 24-month follow-up data were obtained by research coordinators who used standardized report forms and who were guided by a manual of operations with standardized definitions. Medical records were reviewed for patients requiring repeat hospitalization. During follow-up, coronary angiography was obtained as clinically indicated.

**Study Population**

The SES was approved by the US Food and Drug Administration in March 2003 and was available at all registry sites by the time wave 4 began. The PES was approved by the Food and Drug Administration in April 2004. Thus, the majority of DES in wave 4 was SES. Wave 5 had a more even distribution between the 2 types of DES.

Study population characteristics, procedural characteristics, and outcomes, were compared between stent types by Student t tests for continuous variables and χ² tests (asymptotic or Fisher exact test) for categorical variables. Two-year cumulative incidence rates of clinical outcomes (eg, death, MI, repeat PCI, and CABG) and composite outcomes (eg, repeat PCI/CABG and death/MI) were estimated by the Kaplan-Meier method and tested by the log-rank statistic. For determining the CI of the difference in 2 Kaplan-Meier stent thrombosis rates, we assumed that the difference between survival estimates is asymptotically normal (the individual survival estimates are known not to be normal) and used the Central Limit Theorem to calculate the interval. Multivariable Cox proportional hazards regression was used to model cardiac events, with the SES group as the reference category. The 2-year outcome models were fit by use of demographic characteristics, clinical variables, and procedural and lesion characteristics as explanatory variables for adjustment. Covariates were selected by stepwise methods and those considered biologically relevant with a cutoff P value of 0.15 used to enter the model.

**Clinical Outcomes**

Patients were followed up prospectively for 24 months to ascertain the safety end points of death, MI, and stent thrombosis and efficacy end points of repeat PCI, CABG, and repeat revascularization (PCI/CABG). The primary outcomes were analyzed as time to event, with follow-up time measured in days from study entry (index PCI) to the date of the first event (death, MI, stent thrombosis, CABG, or repeat PCI). Those who were event free were censored 24 months after study entry. Stent thrombosis was classified using the Academic Research Consortium definition of definite and probable. All stent thrombosis events were definite or probable and were categorized according to the number of days after the index procedure: early (<30 days), late (31 to 360 days), or very late (>360 days).

**Statistical Analysis**

Patient characteristics pertaining to the index PCI, including demographics, medical history, cardiac presentation, periprocedural medications, procedural characteristics, and outcomes, were compared between stent types by Student t tests for continuous variables and χ² tests (asymptotic or Fisher exact test) for categorical variables. Two-year cumulative incidence rates of clinical outcomes (eg, death, MI, repeat PCI, and CABG) and composite outcomes (eg, repeat PCI/CABG and death/MI) were estimated by the Kaplan-Meier method and tested by the log-rank statistic. For determining the CI of the difference in 2 Kaplan-Meier stent thrombosis rates, we assumed that the difference between survival estimates is asymptotically normal (the individual survival estimates are known not to be normal) and used the Central Limit Theorem to calculate the interval. Multivariable Cox proportional hazards regression was used to model cardiac events, with the SES group as the reference category. The 2-year outcome models were fit by use of demographic characteristics, clinical variables, and procedural and lesion characteristics as explanatory variables for adjustment. Covariates were selected by stepwise methods and those considered biologically relevant with a cutoff P value of 0.15 used to enter the model.

**Results**

**Baseline Patient Characteristics**

Waves 4 and 5 had 4289 patients of which 1005 (23%) had diabetes. Three hundred twenty-eight (33%) received a SES and 677 (67%) received a PES. Table 1 lists the baseline characteristics. The PES and SES groups did not significantly differ with respect to age, gender, or race. Insulin usage between the 2 groups was similar with 29.6% of the PES group and 33.4% of the SES group requiring insulin. More patients in the PES group had hypertension (93% versus 87%, P=0.003) and hyperlipidemia (91% versus 85%, P=0.01).

However, there were no significant differences in mean ejection fraction, previous CABG, previous MI, or cerebrovascular or renal disease. Angiographic data are shown in Table 2. No significant differences in lesion location or in number of diseased vessels existed. There were no major statistically significant differences between the groups with...
respect to the proportion of single-vessel versus multivessel coronary artery disease.

Procedural and Lesion Characteristics

Table 3 illustrates the procedural and lesion characteristics. There was no significant difference with regard to bifurcation lesions, reference vessel size, mean lesion length, or total occlusions. Tortuosity was worse in the PES group, and there were small differences in American College of Cardiology/American Heart Association lesion classification. There was no significant difference in percentage of patients receiving multiple stents. The primary reason for revascularization (ie, asymptomatic, stable angina, and acute coronary syndrome) did not differ significantly between the groups ($P=0.07$). Similarly, the circumstances of the procedure (ie, elective, urgent, or emergent) did not differ significantly. In the entire cohort, 55.8% of the PES-treated patients and 60.7% of the SES-treated patients presented with either an acute MI or unstable angina. Medication use was similar between the 2 groups including use of aspirin and clopidogrel on discharge.

Clinical Outcomes

There were no significant differences in 30-day outcomes of death, MI, or repeat revascularization between the 2 groups (data not shown). The major overall predictors of death or MI in this current cohort of 1005 diabetic patients at 2 years included cardiogenic shock (risk ration [RR], 11.46; 95% CI, 1.4 to 91.5; $P=0.02$), presentation with acute MI (RR, 2.22; 95% CI, 1.5 to 3.2; $P<0.0001$), and baseline renal disease (RR, 2.20; 95% CI, 1.5 to 3.2; $P<0.0001$). Other significant predictors of death and MI included age (RR, 1.02; $P=0.05$), peripheral vascular disease (RR, 1.6; $P=0.04$), class C lesions (RR, 1.46; $P=0.04$), and previous CABG (RR, 1.67; $P=0.009$). For repeat revascularization, important predictors in this overall cohort with diabetes included presentation with unstable angina (RR, 1.1; $P=0.004$) and attempting more lesions (RR, 1.1; $P=0.02$).
of repeat revascularization, representing the composite end point of CABG and repeat PCI, were also similar at 14.8% for the PES group and 17.8% for the SES group ($P=0.36$).

Figure 3 illustrates the 2-year adjusted hazard ratios for both the safety and efficacy end points, with variables adjusted for detailed in the figure legend. Overall, there was no statistically significant difference between PES and SES with regard to efficacy or safety, including stent thrombosis. Propensity score analysis using SES as the reference group confirmed these findings with no significant differences in the combined end points of death and MI (RR, 1.07; 95% CI, 0.75 to 1.52; $P=0.72$) or repeat revascularization (RR, 0.78; 95% CI, 0.55 to 1.10; $P=0.16$). Of the 12 individuals with stent thrombosis, 4 (3.5%) occurred within the PES group (2 early and 2 late), whereas 8 (1.3%) occurred within the SES group (3 early, 3 late, and 2 very late). There were no significant differences in the proportion of patients receiving dual antiplatelet therapy between PES- and SES-treated patients at 6 months (73.4% versus 77.1%, $P=0.22$), 1 year (67.7% versus 68.7%, $P=0.77$), or 2 years (53.2% versus 56.1%, $P=0.44$).

### Impact of Insulin Therapy

Table 5 shows the differences between the 2 groups when stratified by insulin use. The insulin-treated group had higher 2-year rates of death and MI compared with the non–insulin-treated group. The differences were significant within the SES-treated subjects (20.2% versus 10.3%, $P=0.003$) but not within the PES-treated subjects (19.2% versus 13.0%, $P=0.16$). Within the insulin-treated group, PES- and SES-treated subjects had similar 2-year rates of death/MI (19.2% versus 20.2%, $P=0.85$) and CABG/repeat PCI after discharge (16.4% versus 18.4%, $P=0.69$). There were also no major differences between PES and SES within the non–insulin-treated subjects in death/MI (13.0% versus 10.3%, $P=0.25$) or repeat revascularization (14.1% versus 17.6%, $P=0.42$). However, within the non–insulin-treated group, the PES-treated patients had a higher rate of death, compared with the SES-treated patients (9.6% versus 5.7%, $P=0.06$). When subjects were stratified by insulin treatment, there was no significant difference in 2-year rates of stent thrombosis between PES- and SES-treated subjects. The stent thrombosis rates were higher with both stents among insulin-treated diabetic patients (PES=2.1% versus SES=2.8%, $P=0.74$).

### Table 3. Procedural and Lesion Characteristics

<table>
<thead>
<tr>
<th>Lesion Characteristic</th>
<th>PES (n=328)</th>
<th>SES (n=677)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC/AHA lesion classification, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>8.3</td>
<td>11.4</td>
<td>0.04</td>
</tr>
<tr>
<td>B1</td>
<td>36.6</td>
<td>29.5</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>30.9</td>
<td>31.7</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>24.3</td>
<td>27.5</td>
<td></td>
</tr>
<tr>
<td>Mean reference vessel size (SD), mm</td>
<td>3.0 (0.4)</td>
<td>3.0 (0.5)</td>
<td>0.10</td>
</tr>
<tr>
<td>Mean lesion length (SD), mm</td>
<td>17.3 (11.2)</td>
<td>17.3 (11.6)</td>
<td>0.37</td>
</tr>
<tr>
<td>Mean % diameter stenosis (SD)</td>
<td>82.6 (10.1)</td>
<td>83.2 (11.1)</td>
<td>0.24</td>
</tr>
<tr>
<td>Evidence of thrombus, %</td>
<td>10.2</td>
<td>11.4</td>
<td>0.53</td>
</tr>
<tr>
<td>Ulcerated, %</td>
<td>9.3</td>
<td>14.7</td>
<td>0.006</td>
</tr>
<tr>
<td>Bifurcation, %</td>
<td>8.2</td>
<td>10.3</td>
<td>0.23</td>
</tr>
<tr>
<td>Calcified, %</td>
<td>30.1</td>
<td>31.5</td>
<td>0.61</td>
</tr>
<tr>
<td>Ostial, %</td>
<td>8.0</td>
<td>9.2</td>
<td>0.47</td>
</tr>
<tr>
<td>Lesion tortuosity, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None/mild*</td>
<td>69.2</td>
<td>75.8</td>
<td>0.013</td>
</tr>
<tr>
<td>Moderate/severe</td>
<td>30.8</td>
<td>24.2</td>
<td></td>
</tr>
<tr>
<td>Multiple stents</td>
<td>42.9</td>
<td>43.2</td>
<td>0.97</td>
</tr>
<tr>
<td>Stent diameter, mm</td>
<td>2.94</td>
<td>2.95</td>
<td>0.91</td>
</tr>
<tr>
<td>Stent length, cm</td>
<td>17.25</td>
<td>17.26</td>
<td>0.37</td>
</tr>
</tbody>
</table>

*Fisher exact test used for comparison.

### Table 4. 2-Year Cumulative Event Rates

<table>
<thead>
<tr>
<th>Event</th>
<th>PES (n=328)</th>
<th>SES (n=677)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>10.7</td>
<td>8.2</td>
<td>0.20</td>
</tr>
<tr>
<td>MI</td>
<td>6.4</td>
<td>7.2</td>
<td>0.77</td>
</tr>
<tr>
<td>Death/MI</td>
<td>14.9</td>
<td>13.6</td>
<td>0.55</td>
</tr>
<tr>
<td>Stent thrombosis</td>
<td>1.3</td>
<td>1.3</td>
<td>0.95</td>
</tr>
<tr>
<td>Efficacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coronary artery bypass graft surgery</td>
<td>2.6</td>
<td>2.8</td>
<td>0.96</td>
</tr>
<tr>
<td>Repeat PCI after discharge</td>
<td>12.5</td>
<td>16.2</td>
<td>0.21</td>
</tr>
<tr>
<td>Repeat revascularization</td>
<td>14.8</td>
<td>17.8</td>
<td>0.36</td>
</tr>
</tbody>
</table>

Table 4 shows 2-year event rates for the PES and SES groups. There was 99.3% follow-up for wave 4 and 98.6% follow-up for wave 5. No significant differences were detected in the safety or efficacy end points. PES- and SES-treated patients had similar rates of death (10.7% versus 8.2%, $P=0.20$), MI (6.4% versus 7.2%, $P=0.77$), and the combined end point (Figure 1) of death and MI (14.9% versus 13.6%, $P=0.55$). Stent thrombosis rates were identical at 1.3% in both groups. No significant differences in the revascularization rates were detected at 2 years. As shown in Table 4, 2.6% of the PES group and 2.8% of the SES group had CABG ($P=0.96$), whereas 12.5% of the PES-treated patients and 16.2% of the SES-treated patients required repeat PCI after discharge ($P=0.21$). As seen in Figure 2, the rates
compared with the non–insulin-treated subjects (PES = 0.9% versus SES = 0.5%, P = 0.47). The insulin-treated diabetic patients had significantly higher rates of stent thrombosis compared with the non–insulin-treated patients (2.5% versus 0.6%, P = 0.005, Kaplan-Meier difference of 1.9% [0.6% to 3.2%]).

**Discussion**

This is one of the largest studies with 2-year follow-up that compares SES and PES in patients with diabetes. This study shows no significant difference in the rates of death, MI, stent thrombosis, or repeat revascularization between SES and PES in diabetic patients at 2 years. This confirms the results of a recent large meta-analysis of >11 000 diabetic patients that showed no major difference in revascularization and major adverse cardiac event estimates between PES and SES.16

Our results are also comparable with some of the larger registries and with studies with longer follow-up. For example, Daemen et al compared 2-year clinical outcomes in 708 patients with diabetes as part of the RESEARCH and T-SEARCH registries. They showed no significant differences between SES and PES with regard to death/MI (PES 14.7% versus SES 18.2%), target vessel revascularization (PES 9.7% versus SES 15.3%), and stent thrombosis (PES 2.4% versus SES 4.4%).14 In addition, the KOMATE registry, comparing 3-year outcomes in 634 diabetic patients, found no important difference in major adverse cardiac event or stent thrombosis between PES and SES.15

Revascularization rates are higher in our study than might be expected from other trials of diabetic patients receiving DES. This may be partly because of the higher risk patient population in this registry with >55% of patients in both the SES and PES groups presenting with either unstable angina or acute MI. Also, more than half of the patients had multivessel disease and >40% of lesions required multiple stents. In addition, data were collected for repeat PCI after discharge. Thus, some of the revascularizations represented PCI in a different vessel than the index PCI. Nonetheless, our study had similar double-digit revascularization rates as Stankovic et al17 (18.6% for PES and 23.1% for SES). In addition, diabetic patients with multivessel disease in the SYNTAX trial and ARTS-II trial had repeat revascularization rates of 20.3% (PES) and 21.4% (SES), respectively.24,25

Stent thrombosis is an important aspect of DES use. Diabetes has been shown to be an independent predictor of stent thrombosis.26,27 Our study showed low rates of stent thrombosis in both SES and PES at 2 years with rates comparable with patients without diabetes. Very few studies have compared the risk of very late stent thrombosis between SES and PES in this high-risk patient population. The KOMATE registry showed no significant difference in stent thrombosis between SES and PES in patients with diabetes at 3 years (2.8% in SES versus 3.5% in PES).13 In ARTS-II, the rate of definite or probable stent thrombosis in diabetic...
patients receiving a SES at 3 years was 5.0%.25 Although the fact that our stent thrombosis rates at 2 years are relatively low is reassuring, more studies with longer follow-up are needed to evaluate the risk of stent thrombosis in patients with diabetes.

In addition, we showed no significant differences in death/MI or repeat revascularization between insulin-treated patients receiving either SES or PES. Other studies have shown that among diabetic patients, those requiring insulin have higher rates of death, MI, stent thrombosis, and repeat revascularization.7,28,29 We did not show any major differences in repeat revascularization between insulin- and non–insulin-treated patients in either DES group. However, the insulin-treated patients had a higher rate of death and MI than the non–insulin-treated patients, which is consistent with previous studies. The insulin-treated group did have a higher rate of stent thrombosis, which again supports previous studies that have suggested that insulin-treated diabetic patients are at higher risk for this event.30 In addition, the stent thrombosis rate in the non–insulin-treated group, which was significantly lower than in the insulin-treated group, is comparable with rates seen in patients without diabetes.31 Finally, although there is no statistically significant difference in mortality in the insulin-treated group between PES and SES, in the non–insulin-treated group, there seems to be a strong but nonsignificant trend toward less mortality in the SES-treated patients compared with the PES-treated patients. Although this mortality difference was not statistically significant, there is a suggestion that SES may be somewhat safer than PES with regard to survival within this specific subgroup. However, larger studies will be needed to confirm these findings.

Despite the subtle differences observed when patients were categorized by insulin therapy, our findings suggest that there are no major differences between SES and PES within the overall diabetic patient population. Although some controversy may remain over which first-generation DES provides the greatest benefit in diabetic patients, evidence is mounting that there likely no major difference in safety and efficacy between SES and PES. Although it has been shown that SES has less late lumen loss than PES,11–13 it does not appear to consistently reach the threshold of increasing revascularization rates. Also, PES may have a theoretical advantage in patients with diabetes over SES related to its mechanism of action. Diabetes and insulin act via the phosphatidylinositol 3-kinase signal transduction pathway to upregulate the mammalian target of rapamycin; thus, rapamycin’s inhibition of mammalian target of rapamycin and the cell cycle theoreti-

Table 5. 2-Year Cumulative Event Rates for Insulin-Treated Versus Noninsulin-Treated Diabetic Patients

<table>
<thead>
<tr>
<th></th>
<th>Insulin-Treated (n=323)</th>
<th>Noninsulin-Treated (n=682)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PES (n=97)</td>
<td>SES (n=226)</td>
<td>P</td>
</tr>
<tr>
<td>Death</td>
<td>13.3</td>
<td>13.1</td>
<td>0.98</td>
</tr>
<tr>
<td>MI</td>
<td>9.4</td>
<td>11.0</td>
<td>0.80</td>
</tr>
<tr>
<td>Death/MI</td>
<td>19.2</td>
<td>20.2</td>
<td>0.85</td>
</tr>
<tr>
<td>Stent thrombosis</td>
<td>2.1</td>
<td>2.8</td>
<td>0.74</td>
</tr>
<tr>
<td>CABG/repeat PCI after discharge</td>
<td>16.4</td>
<td>18.4</td>
<td>0.69</td>
</tr>
</tbody>
</table>

Figure 3. Adjusted HRs of SES and PES in patients with diabetes. Adjusted HRs (solid rectangles) and 95% CI (horizontal lines) for safety and efficacy outcomes at 2 years comparing PES versus SES. Variables adjusted for death included: age, renal disease, acute myocardial infarction (AMI), β-blockers at discharge, history heart failure, clopidogrel/ticlopidine at discharge, cardiogenic shock, and previous CABG. Variables adjusted for MI included 3-vessel disease, unstable angina, use of insulin, renal disease, attempting a class C lesion, AMI, and previous CABG. Variables adjusted for death/MI included age, cardiogenic shock, peripheral vascular disease (PVD), history of heart failure, use of oral medications for diabetes, AMI, renal disease, attempting a class C lesion, previous CABG, clopidogrel/ticlopidine at discharge, and at least 2 of the following at discharge: β-blockers, calcium channel blockers, long-acting nitrates, ACE inhibitors, statins. Variables adjusted for CABG/repeat PCI included: unstable angina, number of significant lesions, PVD, attempting a class C lesion, and at least 2 of the following at discharge: β-blockers, calcium channel blockers, long-acting nitrates, ACE inhibitors, statins. Variables adjusted for stent thrombosis included: age, pulmonary disease, renal disease, use of insulin, attempting lesion supplyng collaterals, attempting a lesion with thrombus, and attempting a bifurcating lesion.
cally may be attenuated. On the other hand, paclitaxel, which acts via the microtubules, does not use mammalian target of rapamycin or the phosphatidylinositol 3-kinase pathway to inhibit the cell cycle. Furthermore, in contrast to paclitaxel, in vitro models have shown that the antimigratory effects of rapamycin are attenuated under high-glucose conditions. Although intriguing, this hypothetical advantage of paclitaxel was not observed in our study. Our analysis supports the findings of many other registries and meta-analyses that there is no significant difference in event rates between SES and PES in patients with diabetes.14–18

Study Limitations
The Dynamic registry is not a randomized, controlled trial; however, because of its large size and inclusion of a broad range of patients, we believe our results are generalizable. Residual confounding factors may be present that were not accounted for in the multivariate analysis. In addition, the majority of patients from wave 4 received a SES, and we could not account for differences in pharmacological therapy for atherosclerosis and diabetes between the inclusion of subjects in waves 4 and 5. However, although minor differences existed between the 2 stent groups in prevalence of hypertension and hyperlipidemia and in lesion classification, overall, the PES and SES groups were quite similar. The effect sizes observed for specific end points may not have reached statistical significance given the sample size within each group. Although we observed no significant differences in stent thrombosis between the 2 stents, this study was not powered to do so. However, our end point of safety included not only stent thrombosis but also death and MI. In this relatively large population, we found no major difference in the combined end point of death/MI between the 2 stent types, which supports our statement that the safety profiles between the 2 stents are similar.

Conclusion
PES and SES are equally efficacious and have similar safety profiles in diabetic patients undergoing PCI. The rates of death, MI, stent thrombosis, and repeat revascularization in patients with diabetes are similar at 2 years.

Source of Funding
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Disclosures
Dr David Williams is a consultant to Cordis Corporation and receives less than $10 000 in consulting fees.

References


**CLINICAL PERSPECTIVE**

Diabetes mellitus is a significant risk factor for coronary artery disease and a powerful predictor of adverse events in patients undergoing percutaneous coronary interventions. The use of drug-eluting stents in percutaneous coronary interventions has improved outcomes in the treatment of patients with coronary artery disease, including those with diabetes. Currently, controversy remains regarding the optimal drug-eluting stents in patients with diabetes. Overall, there are limited short- and long-term data with respect to direct comparisons of paclitaxel-eluting stents (PES) and sirolimus-eluting stents (SES) in patients with diabetes mellitus. Accordingly, using the National Heart, Lung, and Blood Institute Dynamic Registry, we compared the safety and efficacy of SES and PES in diabetic patients undergoing percutaneous coronary interventions. This study shows no significant difference in the rates of death, myocardial infarction, stent thrombosis, or repeat revascularization between SES and PES in diabetic patients at 2 years. The 2 stent types were found to be equally efficacious and have similar safety profiles in diabetic patients undergoing percutaneous coronary interventions. Over the past 2 years, additional drug-eluting stents have been introduced, but this study was not designed to assess the efficacy and safety of these other stents. Overall, our results, which stem from one of the largest 2-year follow-up studies to compare SES and PES in patients with diabetes, can be applied to the clinical care of diabetic patients with coronary artery disease who are undergoing percutaneous revascularization. These results suggest that the choice of drug-eluting stent (between SES and PES) does not significantly affect either safety or efficacy outcomes.
Paclitaxel-Eluting Versus Sirolimus-Eluting Stents in Diabetes Mellitus: A Report From the National Heart, Lung, and Blood Institute Dynamic Registry

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