Unprotected Left Main Stenting in the Real World

Two-Year Outcomes of the French Left Main Taxus Registry

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Background—Cardiac surgery is the reference treatment for patients with left main (LM) disease, although percutaneous coronary intervention with drug-eluting stents is emerging as a possible alternative. The objective of this registry was to evaluate the 2-year outcome of elective percutaneous coronary intervention for unprotected LM disease with paclitaxel-eluting stents.

Methods and Results—A total of 291 patients were prospectively included from 4 centers. Acute myocardial infarction and cardiogenic shock were the only exclusion criteria. Patients were 69±11 years old, 29% were diabetic, and 25% had 3-vessel disease. For distal LM lesions (78%), the provisional side-branch T-stenting approach was used in 92% of cases and final kissing balloon inflation in 97%. Angiographic success was obtained in 99.7% of cases. At 2-year follow-up, the total cardiac death rate was 5.4% (1 EuroSCORE point was associated with a 15% [95% confidence interval 2.9% to 28.2%, P=0.013] higher risk of cardiac death), target-lesion revascularization was 8.7%, and incidence of Q-wave or non-Q-wave myocardial infarction was 0.9% and 3.1%, respectively. The combined end point occurred in 15.8% of cases and stroke in 0.7%. The incidence of definite and probable LM stent thrombosis was 0.7%, whereas the incidence of any stent thrombosis was 3.8%, with a higher risk in patients with side-branch stenting in the presence of LM bifurcation lesions (hazard ratio 9.6, 95% confidence interval 1.2 to 77.7, P=0.035).

Conclusions—Unprotected LM stenting with paclitaxel-eluting stents, with a strategy of provisional side-branch T-stenting for distal lesions, provides excellent acute angiographic results and good mid-term clinical outcomes, with a 15.8% rate of major adverse cardiac events at 2-year follow-up. (Circulation. 2009;119:2349-2356.)

Key Words: angioplasty ■ stents ■ restenosis ■ drug-eluting stents ■ coronary artery disease

Recent advances in technology, devices, and operator experience, as well as antiplatelet therapy, have led to a steady expansion in the role of percutaneous coronary intervention (PCI) in the treatment of obstructive coronary artery disease. Since the introduction of drug-eluting stents (DES),1 PCI for unprotected left main coronary artery (LM) disease has also reemerged as a possibility and is one of the important challenges and controversies currently facing interventional cardiologists. However, although preliminary registry data have shown promising procedural and short-term follow-up results,2,3 particularly in patients with nonbifurcation stenosis,4 the mid-term benefits are less clear, in part because they have been evaluated less extensively.5,6 Moreover, the heterogeneity of definitions, patient selection criteria, stents, and procedural strategies applied in the various studies conducted so far have made any valid comparisons difficult to establish. The aim of this extensive real-world registry was to examine prospectively the 2-year outcome of patients who underwent elective PCI for unprotected LM disease using only 1 type of DES, the Taxus Express (Boston Scientific, Natick, Mass) paclitaxel-eluting stent (PES), and a uniform technical approach with provisional side-branch (SB) T-stenting in the presence of distal unprotected LM disease.

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Methods

Patient Population
Between May 2003 and June 2005, patients presenting with stable or unstable angina and/or documented ischemia and >50% de novo unprotected LM stenosis were selected for PCI in 4 French centers with previous wide experience in LM stenting with bare-metal stents (BMS). Patient informed consent was obtained both for the procedure and for participation in this registry. Only patients presenting with acute myocardial infarction (MI) or cardiogenic shock were excluded. All patients undergoing PCI for LM disease received PES and were prospectively entered into the database. Patients with
exclusion criteria were treated with the same technical approach, but the stent type was left to the operator’s choice.

**Quantitative Coronary Angiography**

LM lesions were analyzed with a validated edge-detection system. During the inclusion period, dedicated software for bifurcation lesion analysis was not available. Therefore, careful analysis of the reference diameter, minimum lumen diameter, and percent stenosis was performed for the proximal main branch (MB), distal MB, and SB. Lesions located in the distal LM were defined by quantitative coronary angiography according to the Medina classification. Bifurcation lesions were also defined as T shaped when the angle between the proximal MB and SB was $>70^\circ$.

**Procedure**

A uniform technical approach was adopted by the 4 study centers before the beginning of the study. The Taxus Express stent was selected because this platform may provide some advantages over the Cypher stent (Bx velocity), namely, its availability in larger sizes (stent diameter up to 5 mm) and its “open-cell” design (maximum diameter after dilation of a cell up to 3.7 mm), which may allow easier stenting through the MB stent and ensure more stent “conformability” in cases of distal LM lesions. In the presence of proximal or midshaft lesions, the stent was implanted after meticulous imaging of the proximal LM segment, with particular attention given to complete coverage of the LM ostium by the proximal stent edge by use of cranial views. In distal LM lesions, the strategy was provisional SB T-stenting as previously defined for other bifurcation lesions. The decision to stent the SB, usually the left circumflex coronary artery, was made in cases of residual SB stenosis $>50\%$ by visual estimation or in the presence of dissection after final kissing balloon inflation. T-stenting as defined previously was the recommended technique for stent implantation in the SB. The use of the coronary branching pattern law described by Murray and validated by Zhou et al to determine optimal LM stent size was strongly recommended when intravascular ultrasound was not used.

**Antithrombotic Therapy**

Patients received a loading dose of clopidogrel 300 to 600 mg at least 3 hours before undergoing PCI. In addition, aspirin 250 to 500 mg was administered intravenously immediately before the procedure, even in patients who had been pretreated with oral aspirin. The use of glycoprotein IIb/IIIa inhibitors was at the investigators’ discretion. A bolus of unfractionated heparin (70 IU/kg) was administered intravenously, followed by additional boluses as needed to reach and maintain an activated clotting time of 300 seconds during the procedure. In patients treated with glycoprotein IIb/IIIa inhibitors, heparin was administered to maintain an activated clotting time at 250 seconds. After the procedure, patients were treated with clopidogrel 75 mg (or 150 mg in patients weighing $>80$ kg) daily for at least 6 months and with aspirin $>75$ mg indefinitely.

**Study Definitions**

The European System for Cardiac Operative Risk Evaluation (EuroSCORE) was used to stratify the risk of death at 30 days. Patients were stratified as high risk in the presence of a logistic EuroSCORE $>6$. Creatinine clearance was calculated with the Cockcroft-Gault formula, and renal failure was defined as a glomerular filtration rate $<90$ mL · min $^{-1}$ · 1.73 m$^{-2}$. Angiographic success was defined as $<30\%$ residual stenosis in the stented lesion and $<50\%$ in the unstented SB. Non–Q-wave MI was defined as creatine phosphokinase elevation $\geq3$ times the upper limit of normal after the procedure. Target-lesion revascularization (TLR) was defined as any repeat percutaneous intervention or surgical bypass of the target lesion performed for $>50\%$ restenosis of the treated segment from 5 mm proximal to the stent and 5 mm distal to the stent. Restenosis was defined as $>50\%$ angiographic narrowing of a previously successfully treated lesion. Stent thrombosis (ST) was defined, according to the Academic Research Consortium, as definite, probable, or possible and as early (0 to 30 days), late (31 to 360 days), or very late (>1 year) after the index PCI. Deaths due to undetermined causes were classified as cardiac. Major adverse cardiac events (MACE) were defined as a combined end point of cardiac death, Q-wave or non-Q-wave MI, or TLR according to the device-oriented MACE definition.

**Patient Follow-Up Procedures**

All patients were followed up by clinical visit or telephone call at 1 month, 6 to 8 months, 1 year, and 2 years. When the patient was lost to follow-up, the family, physician, or cardiologist was contacted. In case of failure to contact anyone, information about death was obtained from the population registry.

**Statistical Analysis**

Statistical analysis was performed at an independent academic institution (Institute of Social and Preventive Medicine, University of Bern, Switzerland). Continuous variables are presented as mean±SD and categorical variables as numbers and percentages. For each of the events of interest considered, observation time began on the date of stent implantation and ended either on the date of occurrence of the event or on the last day of contact, whichever occurred first. Cumulative incidence curves were estimated by calculating 1 minus the cumulative survival proportions estimated by the Kaplan–Meier method. Cox proportional-hazards models were fitted for selected comparisons of outcomes by patient or procedural characteristics. A probability value $<0.05$ was considered to indicate statistical significance. The analyses were performed with Stata version 10 (StataCorp, College Station, Tex.).

The authors had full access to the data and take full responsibility for the integrity of the data. All authors have read and agree to the manuscript as written.

**Results**

A total of 291 patients were prospectively included in the study. Their baseline, clinical, lesion, and procedural characteristics are listed in Tables 1, 2, and 3. The mean age of the population was 69±11 years; 29% were diabetic, 28% had renal failure, 19% had metabolic syndrome, 25% presented with 3-vessel disease, and the LM lesion was distal in 78%. In cases of distal LM, provisional SB T-stenting was performed in 92%. The SB was stented in 43% of cases, and final kissing balloon inflation was performed in 97%.

**In-Hospital and Short-Term Outcomes**

The procedure was angiographically successful in all but a single patient, who sustained fatal periprocedural ST. One patient underwent emergency coronary artery bypass graft surgery (CABG) after successful LM stenting because of balloon trapping in a diagonal branch. Another patient developed a subocclusion of the proximal left anterior descending coronary artery (distal to the LM stent) 3 days after the index procedure, underwent emergency repeat PCI, and sustained a non–Q-wave MI. Other non–Q-wave MIs were revealed by asymptomatic creatine phosphokinase elevation. Major bleeding complications occurred in 5 patients (1.7%), all of which were related to femoral vascular access and which led to death in 1 case 48 hours after the index procedure. The overall in-hospital MACE rate was 3.1%: cardiac death in 1 patient (0.3%), non–Q-wave MI in 8 patients (2.8%), Q-wave MI in 0%, and TLR in 1 patient (0.3%). Six- to 8-month clinical follow-up was obtained in 99.0% of cases, and the rate of MACE was 10.3%: cardiac death in 5 (1.7%), any MI in 8 (2.7%), and TLR in 18 patients (6.3%).
High-risk patients (additive EuroSCORE SD), % 6.4

Logistic EuroSCORE (mean SD) 4.8

Triple-vessel disease, n (%) 73 (25.1)

No. (%) with history of
Recent MI (<30 d) 19 (6.5)
Old MI (≥30 d) 33 (11.3)
PCI 58 (19.9)
CABG 3 (1.0)

Unstable angina, n (%) 103 (35.4)

Triplet-vessel disease, n (%) 73 (25.1)

Left ventricular ejection fraction (mean SD), % 60.7 ± 12.7

Additive EuroSCORE (mean SD) 4.8 ± 3.4

Logistic EuroSCORE (mean SD) 6.4 ± 10.5

High-risk patients (additive EuroSCORE ≥ 6), n (%) 110 (37.8)

Angiographic Follow-Up and Restenosis
Angiographic follow-up was obtained in 186 (63.9%) of 291 patients at 7.5 ± 4.0 months. Patients were asymptomatic in 75% of cases, had stable angina in 22%, and presented with a non–ST-elevation acute coronary syndrome in 3%. Angiographic binary restenosis was observed in 13% and was focal in 80% of cases. Among 25 cases of restenosis, 18 were in-stent (LM 10, left anterior descending coronary artery 4, and left circumflex coronary artery 4), and 7 were in the stent edge (ostial LM 3, ostial left circumflex coronary artery 2, ostial left anterior descending coronary artery 1, and distal LM 1).

One- and 2-Year Follow-Up
One- and 2-year clinical follow-up was completed in 99.0% of cases. In total, 24 TLRs were recorded, and the TLR rate increased from 7.8% (Figure 1) at 1-year follow-up to 8.7% at 2-year follow-up (6.6% underwent repeat PCI, and 2.2% underwent CABG). Diabetes was associated with a 3.31-fold (95% CI 1.48 to 7.39, P = 0.003) increase in risk of TLR. Further 2-year follow-up was obtained in 22 of the 23 patients who required reintervention. Three patients (14%) had a second reintervention (2 by re-PCI, 1 by CABG), and 1 (4.5%) died of pulmonary infection 7 months after the last PCI. There were no other events among these patients.

The cumulative incidence of cardiac death is shown in Figure 2. Cardiac mortality rate increased from 3.1% at 1 year to 5.4% at 2 years. A 1-point-higher EuroSCORE was associated with a 15% (95% CI 2.9% to 28.2%, P = 0.013) higher risk of cardiac death. In patients with distal LM, the presence of a T-shaped bifurcation lesion was associated with a 3.5-fold (95% CI 1.05 to 11.9, P = 0.041) increase in the risk of cardiac death. Causes of death (cardiac and noncardiac) are summarized in Table 4. The cumulative incidence of MI is shown in Figure 3. In total, 44 MACE were recorded, and the cumulative rate of device-oriented MACE was 12.2% at 1 year and 15.8% at 2 years (Figure 4). At 2 years’ follow-up, the cumulative rate of stroke was 0.8%.

Table 3. Quantitative Angiographic Analysis of Lesions Treated (n = 291)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Before Procedure</th>
<th>After Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>LM proximal reference diameter, mm</td>
<td>3.65 ± 0.53</td>
<td>3.82 ± 0.43</td>
</tr>
<tr>
<td>LM minimum lumen diameter, mm</td>
<td>1.42 ± 1.00</td>
<td>3.44 ± 0.46</td>
</tr>
<tr>
<td>LM percent stenosis</td>
<td>69.73 ± 11.92</td>
<td>7.05 ± 7.81</td>
</tr>
<tr>
<td>MB distal reference diameter, mm</td>
<td>3.21 ± 0.57</td>
<td>3.32 ± 0.54</td>
</tr>
<tr>
<td>SB reference diameter, mm</td>
<td>2.81 ± 0.45</td>
<td>3.21 ± 0.54</td>
</tr>
<tr>
<td>SB MLD, mm</td>
<td>1.87 ± 0.89</td>
<td>2.83 ± 0.49</td>
</tr>
<tr>
<td>SB percent stenosis, %</td>
<td>44.12 ± 30.81</td>
<td>8.81 ± 10.70</td>
</tr>
<tr>
<td>Angiographic success, % of patients</td>
<td>99.7</td>
<td></td>
</tr>
</tbody>
</table>

Values are mean ± SD unless otherwise indicated.
Frequency, Implications, and Predictors of ST

The total rate of definite, probable, and possible LM ST at 2 years was 3.8% (n/1100511), including definite or probable ST in 2 cases (0.68%; Figure 5). According to the timing of the event, early LM ST occurred in 2 cases (1 definite ST during the procedure and 1 probable ST at 8 days), and late or very late ST occurred in 9 cases (all were only possible ST). The clinical, lesion, and procedural characteristics of each patient with ST are listed in Table 5. Stent implantation in the SB in the presence of a LM bifurcation lesion was associated with a 9.6-fold (95% CI 1.2 to 77.7, \(P = 0.035\)) higher risk of any ST.

Discussion

Several observations can be made from this wide-ranging real-world registry. First, in a “real-life” population, as in this registry and other previous unprotected LM stenting registries,2,3,13–15 patients with LM disease have adverse baseline characteristics compared with patients with non-LM disease (advanced age, higher frequency of diabetes mellitus and renal failure, higher EuroSCORE). Second, compared with historical BMS registries of LM stenting, the rate of restenosis and TLR after PES implantation is low (<10% at 2-year follow-up), and in contrast to previous observations with BMS,13,14 LM restenosis after PES implantation appears to be a “benign” process, focal in the majority of cases and predominantly treatable by repeat PCI, with a low rate of further major cardiac events. Third, over a 2-year follow-up period, definite or probable LM ST was a rare occurrence (0.7%), and a clearly higher risk of ST was observed for patients with distal LM disease who received stents in the SB. Fourth, management of LM stenosis with PES with a predefined strategy of provisional SB T-stenting for distal lesions is feasible, is safe in the real world, and is associated with favorable long-term outcomes (5.2% cardiac death rate at 2-year follow-up).

Target-Lesion Revascularization

Although patients treated with DES2,3 for unprotected LM disease have worse clinical and angiographic characteristics than patients treated with BMS,13,14 the rates of in-stent restenosis and TLR appear to be dramatically reduced, and the 8.8% 2-year rate of TLR observed in the present registry after PES implantation is consistent with these studies. This lower rate of TLR was recently confirmed by the randomized study by Erglis et al15 that compared BMS and DES. Little is known about the mid-term and long-term impact of any specific bifurcation stenting strategy for distal LM treatment. Restenosis and TLR vary greatly between DES studies. However, as in non-LM bifurcation lesions, the weight of evidence is more in favor of a provisional SB stenting approach than a more complex strategy that systematically uses 2 stents or more.16,17 As observed in other studies, diabetes mellitus was a strong predictor of TLR.18

Clinical Impact of Restenosis

Given the potentially serious consequences of restenosis after LM stenting, it is reassuring that the majority (87%) of patients with restenosis were asymptomatic or had stable angina at the time of repeat revascularization. The relatively low cardiac mortality rate observed in the present study may be related to a lower rate of restenosis rate than with other studies with BMS or complex approaches and perhaps a more benign form of restenosis observed with DES. The role of repeat PCI for restenosis after DES implantation in the LM has not been investigated previously. In the present study, 23 patients underwent repeat intervention, 83% of whom were treated by repeat PCI (and DES implantation). After an additional 2 years of follow-up in these patients, the overall mortality rate was 4.5% (1 noncardiac death), and a second reintervention was needed in 14%. Were these encouraging results to be confirmed in further studies, a strategy of systematic clinical follow-up with noninvasive testing at 6 to 8 months after the procedure and then annually for the first 2 years might replace the conventional 6- to 8-month systematic angiographic control.

Stent Thrombosis

The debate as to whether DES are more thrombogenic than BMS is unresolved. The comparison of results from the various clinical trials of BMS and DES is hindered by the use...
of relatively restricted and nonuniform definitions of ST. This is one of the few LM registries that uses the Academic Research Consortium definition of ST. When the combination of definite and probable ST was used, the rate of ST was 0.68%, which is relatively low compared with other LM registries using the same definition.6,19 With the addition of definite, probable, and possible ST, the total rate increased to 3.8% at 2 years. However, according to Chieffo et al,19 possible ST may lead to overestimation of the true rate of ST in such a high-risk population (55% ≥70 years old, 38% with a EuroSCORE ≥6, and 28% with renal failure). Several factors have been shown to be associated with an increased risk of ST with DES,20,21 such as the premature discontinuation of antiplatelet therapy. More emphasis on clopidogrel compliance might minimize the incidence of ST after DES implantation. On the basis of these results, we are unable to recommend a minimum time for dual-antiplatelet therapy. Unfortunately, compliance with treatment was not examined, and this may have prevented us from finding any relation between duration of dual-antiplatelet therapy and adverse events. We suggest that it is crucial that before LM PCI is performed, operators ascertain the feasibility and risk/benefits of maintaining dual-antiplatelet therapy for at least 6 months. In the present study, in patients with distal LM lesions, SB stenting substantially increased the risk of ST. Consistent with this finding, several retrospective studies have reported safety concerns in coronary bifurcations in cases in which both branches had been systematically stented.17,22,23 Accord-

Table 4. Cause of Death After Index Procedure

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>&lt;1 y</th>
<th>1 to 2 y</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute ST during the procedure</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pulmonary edema during dialysis, 2 mo</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Inferior Q-wave MI, 9 mo</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Non-Q-wave MI, 20 mo</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Unexplained (8, 58, 62, and 72 d and 10, 14, 16, 18, and 20 mo)</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>LAD restenosis, 10 mo, embolization during PCI</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>End-stage congestive heart and renal failure, 19 mo</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>10 (3.4%)</td>
<td>5 (1.7%)</td>
<td>15 (5.1%)</td>
</tr>
<tr>
<td>Noncardiac</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe groin hematoma, day 2</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Digestive hemorrhage during dialysis, 2 mo</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Infection (4, 13, 19, 20, and 21 mo)</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Stroke during dialysis, 5 mo</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Cancer (4, 7, and 18 mo)</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Digestive disease, 22 mo</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>6 (2.1%)</td>
<td>6 (2.1%)</td>
<td>12 (4.2%)</td>
</tr>
<tr>
<td>Overall total (%)</td>
<td>16 (5.5%)</td>
<td>11 (3.8%)</td>
<td>27 (9.3%)</td>
</tr>
</tbody>
</table>

LAD indicates left anterior descending coronary artery. Values are number of patients or n (%).
ing to Seung et al\textsuperscript{5}, intravascular ultrasound guidance during the procedure should be recommended to achieve correct stent sizing and deployment and an optimal result in both branches.

### Promising 2-Year Outcomes of Unprotected LM Stenting With PES

To date, this is the largest prospective, real-world registry of LM stenting with PES and a provisional SB T-stenting strategy in cases of distal LM disease, with an extensive 2-year follow-up. This study shows that elective LM stenting with PES provides good long-term results, with a 2-year cardiac mortality rate of 5.2%. As in other recent LM registries\textsuperscript{6,19} we found that an increased EuroSCORE was associated with an increased risk of cardiac death. It is noteworthy that the EuroSCORE, which predicts 30-day risk of death after CABG, also predicts the risk of death after LM stenting, but on a longer term. In addition, one of the predictors of cardiac death by univariable analysis was a T-shaped angulation of the distal LM, with a hazard ratio of 3.5. This could be related to a variation in the pattern of fluid flow at the bifurcation level and, potentially, to a higher risk of ST. This hypothesis is currently being investigated.

With regard to long-term follow-up, 3 recent multicenter LM registries have reported encouraging results for PCI at 2- and 3-year follow-up\textsuperscript{5,6,19} To date, only 1 randomized study has been published, by Buszman et al\textsuperscript{24} that compared PCI with DES versus CABG. This small study showed a nonsignificant trend toward better long-term survival in the PCI group ($P=0.081$) and a significantly better ejection fraction ($P=0.01$) at 12-month follow-up, which was the primary end point. The Synergy Between PCI with Taxus and Cardiac Surgery (SYNTAX) trial\textsuperscript{25} which randomized patients with triple-vessel disease and/or LM disease amenable for both treatment options to either PCI with Taxus stents or CABG, showed equivalent safety outcomes. There were, however, more repeat revascularizations in the PCI group, whereas the CABG group had a higher incidence of cerebrovascular accidents. This study will also provide additional important information about the role of lesion complexity,\textsuperscript{26} LM stenting technique, and the angle between the MB and the SB to

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**Table 5. Clinical, Lesion, and Procedural Characteristics for Each Individual Case With ST**

<table>
<thead>
<tr>
<th>ST</th>
<th>Age, y</th>
<th>EuroSCORE</th>
<th>DM</th>
<th>Creatinine Clearance, mL/min/1.73 m$^2$</th>
<th>LVEF, %</th>
<th>Distal LM</th>
<th>% SB Stenosis</th>
<th>Pre-PCI</th>
<th>SB Stent</th>
<th>Outcome After PCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early definite</td>
<td>74</td>
<td>5</td>
<td>Yes</td>
<td>ND</td>
<td>60</td>
<td>Yes</td>
<td>90</td>
<td>Yes</td>
<td>Yes</td>
<td>Death: during PCI</td>
</tr>
<tr>
<td>Early probable</td>
<td>77</td>
<td>4</td>
<td>Yes</td>
<td>56.6</td>
<td>60</td>
<td>Yes</td>
<td>60</td>
<td>Yes</td>
<td>Yes</td>
<td>Sudden death 8 days</td>
</tr>
<tr>
<td>Late possible</td>
<td>75</td>
<td>8</td>
<td>No</td>
<td>ND</td>
<td>60</td>
<td>Yes</td>
<td>70</td>
<td>Yes</td>
<td>Yes</td>
<td>Unexplained death 58 days</td>
</tr>
<tr>
<td>Late possible</td>
<td>50</td>
<td>4</td>
<td>No</td>
<td>143.0.3</td>
<td>ND</td>
<td>Yes†</td>
<td>75</td>
<td>Yes</td>
<td>Yes</td>
<td>Unexplained death 62 days</td>
</tr>
<tr>
<td>Late possible</td>
<td>78</td>
<td>9.8</td>
<td>Yes</td>
<td>35.6</td>
<td>60</td>
<td>No</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>Unexplained death 72 days</td>
</tr>
<tr>
<td>Late possible</td>
<td>71</td>
<td>6</td>
<td>Yes</td>
<td>12.7</td>
<td>50</td>
<td>No</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>Death 2 months: APE during dialysis</td>
</tr>
<tr>
<td>Late possible</td>
<td>80</td>
<td>13</td>
<td>No</td>
<td>83.9</td>
<td>35</td>
<td>Yes</td>
<td>100</td>
<td>No</td>
<td>No</td>
<td>Unexplained death 10 months</td>
</tr>
<tr>
<td>Very late possible</td>
<td>75</td>
<td>7</td>
<td>No</td>
<td>ND</td>
<td>70</td>
<td>Yes†</td>
<td>80</td>
<td>Yes</td>
<td>Yes</td>
<td>Unexplained death 14 months</td>
</tr>
<tr>
<td>Very late possible</td>
<td>51</td>
<td>1</td>
<td>No</td>
<td>ND</td>
<td>40</td>
<td>No</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>Unexplained death 16 months</td>
</tr>
<tr>
<td>Very late possible</td>
<td>80</td>
<td>6</td>
<td>No</td>
<td>99.0</td>
<td>ND</td>
<td>Yes</td>
<td>99</td>
<td>Yes</td>
<td>Yes</td>
<td>Unexplained death 18 months</td>
</tr>
<tr>
<td>Very late possible</td>
<td>68</td>
<td>6</td>
<td>No</td>
<td>81.3</td>
<td>57</td>
<td>Yes</td>
<td>70</td>
<td>Yes</td>
<td>Yes</td>
<td>Unexplained death 20 months</td>
</tr>
</tbody>
</table>

DM indicates diabetes mellitus; LVEF, left ventricular ejection fraction; ND, no data; APE, acute pulmonary edema; and NA, not applicable.

*Renal failure: creatinine clearance rate <30 mL·min$^{-1}$·1.73 m$^2$.
†Dual-antiplatelet therapy discontinuation.

Unless specified otherwise, values are mean±SD.
guide optimal therapeutic decision-making with regard to the choice of PCI or CABG.

**Study Limitations**
The nonrandomized nature of this multicenter observational registry constitutes a major limitation. Because of the exploratory nature of the present study, no a priori sample size was calculated. Only 64% of patients underwent angiographic follow-up. Because all the study patients received PES, these results may not be applicable to all DES. Insufficient information was available both on dual-antiplatelet therapy duration, which was recommended for 6 months, and on the cause of death, particularly after 1 year. Consequently, there was a relatively high rate of late death due to unknown causes, which may have led to an overestimation of the true rate of late ST and cardiac death.

**Conclusions**
In this multicenter real-world registry, we found that elective LM stenting with PES, with a uniform strategy of provisional SB T-stenting in the presence of distal lesions, provided good long-term results, with an 8.9% cumulative need for TLR, a cardiac mortality rate of 5.4%, and a MACE rate of 15.8% at 2 years. Despite these promising results, longer follow-up is needed, and data from randomized trials will help to stratify patients for the appropriate revascularization option.

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**Disclosures**
None.

**References**
This was the largest prospective, multicenter, real-world registry of patients with unprotected left main disease who were treated with a paclitaxel-eluting stent with a uniform technical strategy of provisional side-branch T-stenting for distal left main coronary artery disease. The advanced age and the high proportion of bifurcation disease account for the unselected nature of the population. The results obtained at the 2-year follow-up, complete for 99% of patients, illustrate the safety and efficacy of this technique, with a device-oriented major adverse cardiac event rate of 15.8% (including cardiac death in 5.4% and target-lesion revascularization in 8.7% of patients). Particular attention was paid to left main stent thrombosis, with a low rate of definite or probable stent thrombosis according to Academic Research Consortium definitions at 2-year follow-up (0.7%). This study also provides valuable information about clinical outcomes after distal left main stenting, which in the past has been associated with a higher risk of adverse outcomes. Furthermore, this study addresses the important issue of outcomes in patients with left main restenosis, showing that the vast majority of these patients had stable presentations and focal restenosis, treated in the majority of cases by repeat percutaneous coronary intervention with very acceptable outcomes.
Unprotected Left Main Stenting in the Real World: Two-Year Outcomes of the French Left Main Taxus Registry
Beatriz Vaquerizo, Thierry Lefèvre, Olivier Darremont, Marc Silvestri, Yves Louvard, Jean Louis Leymarie, Philippe Garot, Helen Routledge, Federico de Marco, Thierry Unterseeh, Marcel Zwahlen and Marie-Claude Morice

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