Drug Eluting Stent Implantation For Unprotected Left Main Coronary Arteries

New Tokyo Circulation Research Group
New Tokyo Hospital
Sunao Nakamura M.D,Ph.D.
Drug-Eluting Stent for Left Main Coronary Artery

Sirolimus-eluting stent implantation for unprotected left main coronary artery stenosis. Comparison with bare metal stent implantation.

   J Am Coll Cardiol 2005;45:351-6

Rapamycin-eluting stents for the treatment of unprotected left main coronary disease.

   Am Heart 2004;148:481-5

Short- and Long-Term Clinical Outcome After Drug-Eluting Stent Implantation for the Percutaneous Treatment of Left Main Coronary Artery Disease.

   Circulation 2005;111:1383-1389

Early and Mid-Term Results of Drug-Eluting Stent Implantation in Unprotected Left Main.

   Circulation 2005;111:791-795

Sirolimus-Eluting Versus Paclitaxel-Eluting Stent Implantation for the Percutaneous Treatment of Left Main Coronary Artery Disease.

   J Am Coll Cardiol 2006;47:507-14

Serial Angiographic Follow-up of Sirolimus-Eluting Stents for Unprotected Left Main Coronary Artery Revascularization.

   J Am Coll Cardiol 2006;47:871-7
Drug-Eluting Stent for Left Main Coronary Artery

   Initial clinical experience of Sirolimus-eluting stent for treatment of left main coronary artery disease.
   JSC 2004

   Durable clinical benefit following Sirolimus-eluting stent deployment on the outcome of patients with unprotected left main coronary arteries.
   TCT 2004, ACC 2005

   Comparison of efficacy and safety between Sirolimus-eluting stent and Paclitaxel-eluting stent in unprotected left main coronary.
   ACC 2005, ESC 2005
-Multicenter Registry in Asia-

New Tokyo Hospital  Sunao Nakamura M.D., Ph.D. (Japan)
Damansara Heart Center  Tamil Selvan Muthusamy M.D. (Malaysia)
Konyang University Hospital  Jang-Ho Bae M.D. (Korea)
Husada Hospital  Yeo Hans Cahyadi M.D. (Indonesia)
Chest Disease Institute  Sudaratana Transapasawasdikul M.D. (Thailand)
Siriaj Hospital  Damras Tresukosol M.D. (Thailand)
Saint Louis Hospital  Boonsert Chatlaong M.D. (Thailand)
King Chulalongkorn Memorial Hospital  Wasan Udayachaler M.D. (Thailand)
Far Eastern Hospital  Chao Loun Lai M.D. (Taiwan)
Study Patients: LMT

TAXUS: Asian Multicenter LMT Registry
- Patients n=118 > 2 years
- Patients n=211 > 1 year

Cypher: Asian Multicenter LMT Registry
- Patients n=89 > 3 years
- Patients n=193 > 2 years
- Patients n=288 > 1 year

BMS: Japanese Multicenter Registry
- Patients n=88 > 3 years
- Patients n=102 > 2 years

Angioplasty Summit Seoul
Can We Improve Clinical Outcome of LMT PCI?

In hospital outcome

Can reduce restenosis?

Long term durability?

Cypher and TAXUS registry

Other DES?
## In-Hospital Outcome

<table>
<thead>
<tr>
<th></th>
<th>BMS (n=102)</th>
<th>Cypher (n=193)</th>
<th>TAXUS (n=118)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angiographic success (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>NS</td>
</tr>
<tr>
<td>Clinical success (%)</td>
<td>99.0</td>
<td>100</td>
<td>100</td>
<td>NS</td>
</tr>
<tr>
<td>MACE (n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>QMI</td>
<td>1 (SAT)</td>
<td>0</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>Urgent CABG</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>Urgent PCI</td>
<td>1 (SAT)</td>
<td>0</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>Minor complication (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vascular hematoma</td>
<td>4.9</td>
<td>5.2</td>
<td>6.0</td>
<td>NS</td>
</tr>
</tbody>
</table>

No SAT
30 DAYS: MACE

DES in LMT

(NO SAT)

(%)

15
10
5
0

0

Park
Valgimigli
Chieffo
Price
Nakamura

Angioplasty Summit  Seoul
Can We Improve Clinical Outcome of LMT PCI?

- In hospital outcome
- Can reduce restenosis?
- Long term durability?
- Cypher and TAXUS registry
- Other DES?
Can We Improve Clinical Outcome of LMT PCI?

- In hospital outcome
- Can reduce restenosis?
- Long term durability?
- Cypher and TAXUS registry
- Other DES?
Restenosis Rate

<table>
<thead>
<tr>
<th>Name</th>
<th>Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park</td>
<td>7.0</td>
</tr>
<tr>
<td>Valgimigli</td>
<td>14.1</td>
</tr>
<tr>
<td>Chieffo</td>
<td>12.0</td>
</tr>
<tr>
<td>Price</td>
<td>38.0</td>
</tr>
<tr>
<td>Nakamura</td>
<td>7.1</td>
</tr>
</tbody>
</table>

DES in LMT
# Angiographic Follow-Up

<table>
<thead>
<tr>
<th></th>
<th>BMS 12 mo (n=102)</th>
<th>BMS 24 mo (n=102)</th>
<th>Cypher 12 mo (n=193)</th>
<th>Cypher 24 mo (n=193)</th>
<th>TAXUS 12 mo (n=118)</th>
<th>TAXUS 24 mo (n=118)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical f/u (n)</td>
<td>102/102</td>
<td>102/102</td>
<td>193/193</td>
<td>193/193</td>
<td>118/118</td>
<td>118/118</td>
<td>NS</td>
</tr>
<tr>
<td>Angiographic f/u (n)</td>
<td>100/102</td>
<td>94/102</td>
<td>170/193</td>
<td>146/193</td>
<td>110/118</td>
<td>82/118</td>
<td>NS</td>
</tr>
<tr>
<td>Ref. diameter (mm:mean)</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.6</td>
<td>3.5</td>
<td>3.6</td>
<td>NS</td>
</tr>
<tr>
<td>MLD (mm:mean)</td>
<td>2.6</td>
<td>2.6</td>
<td>3.3</td>
<td>3.2</td>
<td>3.0</td>
<td>3.0</td>
<td>0.01</td>
</tr>
<tr>
<td>Late loss (mm:mean)</td>
<td>0.9</td>
<td>0.9</td>
<td>0.2</td>
<td>0.2</td>
<td>0.4</td>
<td>0.4</td>
<td>0.01</td>
</tr>
<tr>
<td>Loss index (%:mean)</td>
<td>36.0</td>
<td>36.0</td>
<td>8.0</td>
<td>8.0</td>
<td>12.6</td>
<td>12.6</td>
<td>0.01</td>
</tr>
<tr>
<td>Restenosis rate (%)</td>
<td>19.6</td>
<td>19.6</td>
<td><strong>6.2</strong></td>
<td><strong>6.2</strong></td>
<td><strong>8.4</strong></td>
<td>8.4</td>
<td>0.01</td>
</tr>
<tr>
<td>TLR (%)</td>
<td>14.7</td>
<td>14.7</td>
<td><strong>4.7</strong></td>
<td><strong>4.7</strong></td>
<td><strong>7.6</strong></td>
<td>7.6</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Restenosis Patients !!

<table>
<thead>
<tr>
<th>Location</th>
<th>BMS</th>
<th>Cypher</th>
<th>TAXUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ostium</td>
<td>3.9</td>
<td>0</td>
<td>6.2</td>
</tr>
<tr>
<td>Mid shaft</td>
<td>0</td>
<td>1.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Bifurcation</td>
<td>14.7</td>
<td>7.6</td>
<td>0</td>
</tr>
</tbody>
</table>

Angioplasty Summit Seoul
## TLR Patients: 4.7%

<table>
<thead>
<tr>
<th>No.</th>
<th>Age</th>
<th>Gender</th>
<th>Lesion location</th>
<th>Stenting strategy</th>
<th>Location of restenosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.1</td>
<td>78</td>
<td>F</td>
<td>Bifurcation</td>
<td>Stenting across LCX</td>
<td>LCX ostium</td>
</tr>
<tr>
<td>No.2</td>
<td>54</td>
<td>M</td>
<td>Bifurcation</td>
<td>Culotte</td>
<td>LCX ostium</td>
</tr>
<tr>
<td>No.3</td>
<td>69</td>
<td>M</td>
<td>Bifurcation</td>
<td>Culotte</td>
<td>LCX ostium</td>
</tr>
<tr>
<td>No.4</td>
<td>77</td>
<td>M</td>
<td>Bifurcation</td>
<td>Culotte</td>
<td>LCX ostium</td>
</tr>
<tr>
<td>No.5</td>
<td>68</td>
<td>M</td>
<td>Bifurcation</td>
<td>Culotte</td>
<td>LCX ostium</td>
</tr>
<tr>
<td>No.6</td>
<td>77</td>
<td>M</td>
<td>Bifurcation</td>
<td>Modified T</td>
<td>LCX ostium</td>
</tr>
<tr>
<td>No.7</td>
<td>82</td>
<td>M</td>
<td>Bifurcation</td>
<td>Crushing</td>
<td>Distal stent edge</td>
</tr>
<tr>
<td>No.8</td>
<td>62</td>
<td>M</td>
<td>Bifurcation</td>
<td>Crushing</td>
<td>LAD ostium</td>
</tr>
<tr>
<td>No.9</td>
<td>65</td>
<td>F</td>
<td>Bifurcation</td>
<td>Crushing</td>
<td>LCX ostium</td>
</tr>
<tr>
<td>No.</td>
<td>Age</td>
<td>Gender</td>
<td>Lesion location</td>
<td>Stenting strategy</td>
<td>Stent</td>
</tr>
<tr>
<td>-----</td>
<td>-----</td>
<td>--------</td>
<td>----------------</td>
<td>-------------------</td>
<td>--------</td>
</tr>
<tr>
<td>No.1</td>
<td>69</td>
<td>M</td>
<td>Bifurcation</td>
<td>Culotte</td>
<td>TAXUS</td>
</tr>
<tr>
<td>No.2</td>
<td>77</td>
<td>M</td>
<td>Bifurcation</td>
<td>Culotte</td>
<td>TAXUS</td>
</tr>
<tr>
<td>No.3</td>
<td>70</td>
<td>M</td>
<td>Bifurcation</td>
<td>Crush</td>
<td>TAXUS</td>
</tr>
<tr>
<td>No.4</td>
<td>73</td>
<td>M</td>
<td>Bifurcation</td>
<td>Crush</td>
<td>TAXUS</td>
</tr>
<tr>
<td>No.5</td>
<td>73</td>
<td>M</td>
<td>Bifurcation</td>
<td>Crush</td>
<td>TAXUS</td>
</tr>
<tr>
<td>No.6</td>
<td>78</td>
<td>F</td>
<td>Bifurcation</td>
<td>Stenting across LCX</td>
<td>TAXUS</td>
</tr>
<tr>
<td>No.7</td>
<td>82</td>
<td>M</td>
<td>Bifurcation</td>
<td>Kissing stent</td>
<td>TAXUS</td>
</tr>
<tr>
<td>No.8</td>
<td>68</td>
<td>M</td>
<td>Bifurcation</td>
<td>Culotte</td>
<td>TAXUS</td>
</tr>
<tr>
<td>No.9</td>
<td>54</td>
<td>M</td>
<td>Bifurcation</td>
<td>Stenting across LCX</td>
<td>TAXUS</td>
</tr>
</tbody>
</table>
Can We Perform LMT PCI in ALL Cases?

- Severely calcified cases
- Bifurcation lesion
- CTO
- ISR
- Low EF: Improve LV contraction?
Stenting Procedure of bifurcation lesion in LMT

Park
- Single
- Kissing
- Crush
- Others

Valgimigli
- Single
- Kissing
- Crush
- T-stent
- Culotte

Chieffo
- Single
- Crush
- T-stent
- Culotte
- V-stent

Price
- Single
- Kissing
- Crush
- Others

Nakamura
- Single
- Crush
- T-stent
- Culotte

0 50 100 (%)
Case 7: LMT bifurcation lesion

Pre LMT bifurcation lesion

Culotte stenting

Post

Restenosis LCX ost.

LCX ostial ISR

Follow-up

LMT1

Distal

Angioplasty Summit Seoul
If we really want double stenting….

**Mini-Crushling Stenting Technique (1)**

1st step

- **Main Artery**
- **Side branch**

- Double wiring to the both branch and kissing ballooning

2nd step

- Advance the two stents in the bifurcation lesion simultaneously and dilated of stent in side branch only

Angioplasty Summit  Seoul
Mini-Crushing Stenting Technique (2)

3rd step

Remove the stent balloon and wire from the side branch and Deploy the stent in the main vessels

4th step

Recross the wire through the stent strut in the main vessel to the side branch

5th step

Kissing ballooning to the both vessels
## Follow-Up Results 12mo

<table>
<thead>
<tr>
<th></th>
<th>Single stenting n=79</th>
<th>Culotte stenting n=46</th>
<th>Modified T-stenting n=42</th>
<th>Crushing stenting n=24</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Angiographic follow-up (%)</strong></td>
<td>88.6</td>
<td>91.3</td>
<td>85.7</td>
<td>91.7</td>
</tr>
<tr>
<td><strong>Angiographic restenosis (n)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LMT - LAD</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LMT - LCX</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>In-hospital MACE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>12-month total MACE (n)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MI</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CABG</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TLR</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Angioplasty Summit  Seoul
Can We Improve Clinical Outcome of LMT PCI?

- In hospital outcome
- Can reduce restenosis?
- Long term durability?
- Cypher and TAXUS registry
- Other DES?
Can We Perform LMT PCI in ALL Cases?

- Severely calcified cases
- Bifurcation lesion
- CTO
- ISR
- Low EF: Improve LV contraction?
Can We Perform LMT PCI in ALL Cases?

- Severely calcified cases
- Bifurcation lesion
- CTO
- ISR
- Low EF: Improve LV contraction?
Can We Perform LMT PCI in ALL Cases?

- Severely calcified cases
- Bifurcation lesion
- CTO
- ISR
- Low EF: Improve LV contraction?
Conclusions

1. Treatment of unprotected left main trunk coronary artery disease with Cypher Sirolimus-eluting stent and Paclitaxel-eluting stent are safe and feasible.

2. Implantation of Cypher Sirolimus-eluting stent and Paclitaxel-eluting stent result in a larger MLD at follow-up and dramatically decrease the restenosis rate and target lesion revascularization compared with implantation of bare metal stent.

3. Implantation of Cypher Sirolimus-eluting stent and Paclitaxel-eluting stent with modified T-stenting with mini-crush stenting technique and single stenting technique seems to be able to decrease the restenosis rare at follow-up compared with other stenting techniques.

4. These clinical benefits with Cypher Sirolimus-eluting stent and Paclitaxel-eluting stent are durable at least 2 years.