Clinical Outcome of Drug Eluting Stent for LMT Lesions

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Kawasaki Social Insurance Hospital
Classification of Bifurcation Lesion

-ICPS classification-

Type.1
Type.2
Type.3
Type.4
Type.4a
Type.4b
Treatment for bifurcation lesions

- Kissing stents
- T-stenting / Modified T-stenting
- “Culotte” or Y stenting
- V-stenting
- Skirt stenting
- Crushing / Reverse-Crushing

Kawasaki Social Insurance Hospital, Kanagawa, Japan
Cypher™ Compared with Bare Stents

Main Vessel

In-Lesion Restenosis

From SIRIUS data

Kawasaki Social Insurance Hospital, Kanagawa, Japan
Cypher™ Compared with Bare Stents

Side-Branch
In-Lesion Restenosis

From SIRIUS data

Kawasaki Social Insurance Hospital, Kanagawa, Japan
### Complex DES vs simple DES stenting

<table>
<thead>
<tr>
<th></th>
<th>47</th>
<th>44</th>
</tr>
</thead>
<tbody>
<tr>
<td>main</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>side</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>both</td>
<td>0%</td>
<td>5%</td>
</tr>
<tr>
<td>restenosis</td>
<td>7%</td>
<td>20%</td>
</tr>
</tbody>
</table>

*Pan M: Am Heart J 2004*
Crush Technique
or
Y stenting
Crush Technique

Derived from Sharma et al
Problem of Crush!

Ormiston 2003

Kawasaki Social Insurance Hospital, Kanagawa, Japan
After “crush”  

“Kissing” releases side-br from jail

Ormiston 2003  
Kawasaki Social Insurance Hospital, Kanagawa, Japan
**Crush Technique + KBT**

**Role of Final Kissing Balloon Inflation**

**Acute angiographic results**

<table>
<thead>
<tr>
<th></th>
<th>Kissing</th>
<th>No Kissing</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB residual stenosis (%)</td>
<td>2±4</td>
<td>9±15</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>SB residual stenosis (%)</td>
<td>7±8</td>
<td>20±18</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>TVR (%)</td>
<td>10</td>
<td>22</td>
<td>NS</td>
</tr>
</tbody>
</table>

*Moussa et al, ACC 2004*
Clulotte Stenting

- **Full coverage of bifurcation**
- **No gap**

**Pit hole**
- 2 times guide wire exchange
- Sometimes, Balloon or guidewire is difficult to cross beyond the stent strut.
- Chance to trapping guidewire
- Small Stent CSA at intersection point
Y-stent (culotte stent) technique

Kawasaki Social Insurance Hospital, Kanagawa, Japan
Left Main Trunk Disease in DES
## Cypher stent for LMT

<table>
<thead>
<tr>
<th>N</th>
<th>78 patients 78 lesions</th>
<th>2004.8～2005.11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>70.7±10.0 y.o.</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>female 17</td>
<td></td>
</tr>
</tbody>
</table>

### Diagnosis

- AMI: 4 case
- UAP: 12 case
- AP: 62 case

- De novo lesion: 63 lesion
- Stent restenosis: 15 lesion

- Non protected LMT lesion: 75 lesion (96.1%)
- IABP support: 4 case
<table>
<thead>
<tr>
<th>Location</th>
<th>#6 or 11 just proximal</th>
<th>11 lesion</th>
<th>11 lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ostium</td>
<td>5 lesion</td>
<td>11 lesion</td>
<td>11 lesion</td>
</tr>
<tr>
<td></td>
<td>6.4%</td>
<td>14.1%</td>
<td>14.1%</td>
</tr>
<tr>
<td>Shaft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bifurcation</td>
<td>51 lesion</td>
<td>65.4%</td>
<td></td>
</tr>
</tbody>
</table>
# Strategy for LMT

<table>
<thead>
<tr>
<th></th>
<th>De novo</th>
<th>ISR lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=63</td>
<td>n=15</td>
</tr>
</tbody>
</table>

**Single stent**

- LMT-LAD single: 29, 3
- LMT-Cx single: 1, 1
- $\gamma$ stent: 1, 0
- Cutting stent: 1, 1

**Two stent**

- T-stent: 1, 1
- Modified T: 1, 0
- Crush stent: 2, 0
- Reverse Crush: 1, 0
- Y-stent: 21, 9
- Modified V: 5, 0
- SKS: 0, 0

*Kawasaki Social Insurance Hospital, Kanagawa, Japan*
### QCA results: LMT-LAD

#### Angiographical FU 58 cases (74.4%)

<table>
<thead>
<tr>
<th></th>
<th>De novo ( n = 46 )</th>
<th>ISR lesion ( n = 12 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre MLD</td>
<td>1.1 ± 0.4</td>
<td>0.8 ± 0.4</td>
</tr>
<tr>
<td>Ref.d</td>
<td>3.2 ± 0.7</td>
<td>2.7 ± 0.6</td>
</tr>
<tr>
<td>%DS</td>
<td>66.8 ± 10.6</td>
<td>70.1 ± 14.3</td>
</tr>
<tr>
<td>Post MLD</td>
<td>3.1 ± 0.6</td>
<td>3.1 ± 0.6</td>
</tr>
<tr>
<td>%DS</td>
<td>9.0 ± 8.8</td>
<td>6.3 ± 13.4</td>
</tr>
<tr>
<td>FU MLD</td>
<td>2.9 ± 0.8</td>
<td>2.5 ± 0.7</td>
</tr>
<tr>
<td>Ref.d</td>
<td>3.5 ± 0.7</td>
<td>3.1 ± 0.4</td>
</tr>
<tr>
<td>%DS</td>
<td>16.8 ± 17.4</td>
<td>21.1 ± 17.9</td>
</tr>
</tbody>
</table>
### QCA results: LMT-Cx

<table>
<thead>
<tr>
<th></th>
<th>De novo</th>
<th>ISR lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=46</td>
<td>n=12</td>
</tr>
<tr>
<td>Post MLD</td>
<td>2.52 ± 0.45</td>
<td>2.45 ± 0.62</td>
</tr>
<tr>
<td>Ref.d</td>
<td>3.05 ± 0.52</td>
<td>2.91 ± 0.51</td>
</tr>
<tr>
<td>%DS</td>
<td>17.11 ± 9.79</td>
<td>15.66 ± 16.34</td>
</tr>
<tr>
<td>FU MLD</td>
<td>1.98 ± 0.81</td>
<td>1.86 ± 0.93</td>
</tr>
<tr>
<td>Ref.d</td>
<td>3.21 ± 0.69</td>
<td>2.92 ± 0.60</td>
</tr>
<tr>
<td>%DS</td>
<td>36.82 ± 25.94</td>
<td>36.62 ± 27.3</td>
</tr>
</tbody>
</table>
Clinical results

Initial success 78(100%)
In hospital MACE 0(0%)
FU 213 ± 97 days

Restenosis 11case
TVR 10case(17.2%)

<table>
<thead>
<tr>
<th>Binary restenosis</th>
<th>TVR</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAD and Cx</td>
<td>2case</td>
</tr>
<tr>
<td>LAD</td>
<td>0case</td>
</tr>
<tr>
<td>LCx</td>
<td>9case</td>
</tr>
</tbody>
</table>
## TVR case

<table>
<thead>
<tr>
<th>Type of restenosis</th>
<th>Previous PCI</th>
<th>LMT type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both restenosis</td>
<td>Ystent 2</td>
<td>Bif 2(100%)</td>
</tr>
<tr>
<td>Cx restenosis</td>
<td>Ystent 4</td>
<td>Bif 8(100%)</td>
</tr>
<tr>
<td></td>
<td>Tstent 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mod. V 3</td>
<td></td>
</tr>
</tbody>
</table>
Pre-procedure

VA: 21.3 ± 9.9 mm²
LA: 7.9 ± 3.8 mm²

VA: 16.7 ± 7.0 mm²
LA: 6.6 ± 3.7 mm²

LA: 6.3 ± 4.8 mm²

VA: 11.9 ± 7.3 mm²

2.9 ± 1.5 mm²

3.8 ± 1.5 mm²

2.6 ± 1.7 mm²
Post-procedure

Kawasaki Social Insurance Hospital, Kanagawa, Japan

LMT

LAD

LCx

MSA/ref LA

8.8 ± 3.4mm²

4.7 ± 1.8mm²

5.0 ± 2.8mm²

4.1 ± 1.9mm²

5.3 ± 3.1mm²

89.9%

102.2%

73.6%

99.3%

Kawasaki Social Insurance Hospital, Kanagawa, Japan
Post-procedure

LMT

- de novo: 4.5 ± 1.9mm²
- Stent in stent: 5.0 ± 1.7mm²

LAD

- de novo: 4.3 ± 1.8mm²
- Stent in stent: 3.5 ± 1.8mm²

LCx

Kawasaki Social Insurance Hospital, Kanagawa, Japan
Minimal stent CSA, ref. EEM CSA

- **de novo**: n=49, 7.2 mm²
- **SIS**: n=17, 6.8 mm²
- **Y-stent**: n=6, 4.8 mm²
- **SIS+Y-stent**: n=11, 3.9 mm²

- *p<0.05 vs de novo, Y-stent, SIS+Y-stent
- **p<0.05 vs de novo, SIS**
- ***p<0.0001 vs de novo, SIS**

Kawasaki Social Insurance Hospital, Kanagawa, Japan
Paclitaxel eluting stent for LMT bifurcation

<table>
<thead>
<tr>
<th></th>
<th>PES</th>
<th>BMS</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>49</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Death or MI</td>
<td>1</td>
<td>5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TVR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeat PCI</td>
<td>0</td>
<td>6(10.5%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CABG</td>
<td>1(2%)</td>
<td>9(15.7%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Death or MI or TVR</td>
<td>2(4%)</td>
<td>20(35%)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Carrie D et al; Eur Interv 1. 396-402
Paclitaxel eluting stent for LMT bifurcation

-Angiographic Restenosis-

Carrie D et al.: Eur Interv 1. 396-402

Kawasaki Social Insurance Hospital, Kanagawa, Japan
Sirolimus eluting stent for LMT bifurcation

Price MJ et al : JACC 47,871,06

Kawasaki Social Insurance Hospital, Kanagawa, Japan
Sirolimus eluting stent for LMT bifurcation

Price MJ et al.: JACC 47,871,06

Kawasaki Social Insurance Hospital, Kanagawa, Japan
Technical Point of DES for Bifurcation

1. Preserve for main vessel is important.
2. Almost GW and Balloon can access the strut to side branch.
3. However, it care about RD<3.0mm, calcium, tortous vessel.
4. Safe use of coating wire cross to side branch.
5. If Trapped wire occurred, 1.5mm balloon dilatation is useful.
7. Insufficient dilatation frequently occurred at intersection point especially LMT to CX.
8. Bifucation ISR lesion is highly restenosis cases.
9. Modified T-stenting will be hopeful??
Even DES Era

One stent better than two stents for Bifurcation