Session: Left mains & bifurcation intervention

An integrated approach to bifurcation lesions: lessons from years of randomized trials, registries, debates and “mature thinking”

15 min

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BMS and DES: side branch issue overemphasized

- BMS (Yamashita et al, JACC 2000)
- DES (Ge et al, AJC 2005)

% of Patients

- MACE
- TLR
- MB - ISR
- SB - ISR

1 STENT

- MACE: 38,0%
- TLR: 36,0%
- MB - ISR: 33,3%
- SB - ISR: 33,3%

2 STENT

- MACE: 51,0%
- TLR: 38,0%
- MB - ISR: 38,5%
- SB - ISR: 13,5%
Studies with DES

<table>
<thead>
<tr>
<th>Study</th>
<th>1S MACE</th>
<th>2S MACE</th>
<th>1S TVR</th>
<th>2S TVR</th>
<th>1S TLR</th>
<th>2S TLR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colombo et al (Circ 2004)</td>
<td>13.6%</td>
<td>19.0%</td>
<td>9.0%</td>
<td>9.5%</td>
<td>4.5%</td>
<td>19.0%</td>
</tr>
<tr>
<td>Pan et al (AHJ 2004)</td>
<td>10.6%</td>
<td>11.4%</td>
<td>6.3%</td>
<td>9.0%</td>
<td>4.5%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Nordic (Circ 2006)</td>
<td>2.9%</td>
<td>1.9%</td>
<td>1.9%</td>
<td>3.4%</td>
<td>1.0%</td>
<td>1.9%</td>
</tr>
</tbody>
</table>

* n=85 6-month
* n=91 6-month
* n=413 6-month
Angiographic Restenosis

Colombo et al (Circ 2004)  
1 Stent: 18.7%  
2 Stents: 28.0%  
- Bifurcation: 4.8%  
- Main Branch: 5.7%  
- Side Branch: 7.0%  

Pan et al (AHJ 2004)  
1 Stent: 21.8%  
2 Stents: 20.0%  
- Bifurcation: 5.0%  
- Main Branch: 5.0%  
- Side Branch: 5.0%  

Nordic (Circ 2006)  
1 Stent: 22.5%  
2 Stents: 19.2%  
- Bifurcation: 4.6%  
- Main Branch: 5.1%  
- Side Branch: 11.5%  

n=91  
6 month
Thrombosis in bifurcations
Thrombosis rates

Colombo et al (Circ 2004) 3.5%
Ge et al (JACC 2005) 2.8%
Moussa et al (AJC 2006) 1.7%
Hoye et al (JACC 2006) 4.3%
Nordic (Circ 2006) 0.2%
## NORDIC Bifurcation Study

### Individual End Points after 6 months

<table>
<thead>
<tr>
<th></th>
<th>1 Stent</th>
<th>2 Stents</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patients</strong></td>
<td>207</td>
<td>206</td>
<td></td>
</tr>
<tr>
<td><strong>Cardiac death</strong></td>
<td>2 (1.0)</td>
<td>2 (1.0)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Myocardial infarction</strong></td>
<td>0 (0.0)</td>
<td>1 (0.5)</td>
<td>0.31</td>
</tr>
<tr>
<td><strong>Stent thrombosis</strong></td>
<td>1 (0.5)</td>
<td>0 (0.0)</td>
<td>0.31</td>
</tr>
</tbody>
</table>

*Steigen et al. Circulation 2006*
NORDIC Bifurcation Study
2 Stents Techniques Implemented

%  
0 10 20 30 40 50 60

Crush Culotte Other

50% 21% 29%

Steigen et al Circulation 2006
### Predictors of stent thrombosis

**Analysis of 2229 pts with 9 m FU  Iakovou JAMA 2005**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>OR</th>
<th>95% CI</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td>Prior Brachytherapy</td>
<td>4.18</td>
<td>0.70-24.67</td>
<td>0.1</td>
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<tr>
<td>Renal Failure</td>
<td>11.48</td>
<td>4.27-30.83</td>
<td>&lt;0.0001</td>
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<tr>
<td>Unprotected Left Main</td>
<td>2.96</td>
<td>0.80-10.97</td>
<td>0.1</td>
</tr>
<tr>
<td>2 stents per bifurcation</td>
<td>1.23</td>
<td>0.42-3.60</td>
<td>0.7</td>
</tr>
<tr>
<td>Stents per lesion</td>
<td>1.49</td>
<td>0.81-2.73</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Bifurcation</strong></td>
<td><strong>7.19</strong></td>
<td><strong>2.36-21.82</strong></td>
<td><strong>&lt;0.0001</strong></td>
</tr>
<tr>
<td>Diabetes</td>
<td>3.36</td>
<td>1.53-7.37</td>
<td>0.02</td>
</tr>
<tr>
<td>Ejection Fraction</td>
<td>1.09</td>
<td>1.05-1.13</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>
Bifurcations

1. Provisional
2. Two Stents
3. Keep It Open (KIO)
When the SB has minimal disease or only at the ostium AND when the SB is suitable for stenting

6 Fr guiding catheter

1. Wire both branches
2. Dilate MB and SB if needed
3. Stent MB leaving a wire in the SB
4. Re-wire SB and then remove jailed wire
5. Kissing balloon inflation
6. Stent SB only if suboptimal result (TAP or reverse crush)
SB protection

Lesion on LAD-Diag

Baseline Angiography

Stent on LAD

Xience 3.0x28mm
After Stent

POBA on Diag

balloon 3.0x20mm
Bifurcations

Two Stents

When the SB has disease extending beyond its ostium AND when the SB is suitable for stenting

8 Fr guiding catheter

1. Wire both branches

2. Dilate MB and SB if needed

3. Perform crush or V-stent

4. If crush: rewire SB and perform high pressure SB dilatation

5. Kissing balloon inflation
1 or 2 stents?

A) If the side branch is significantly diseased at its ostium or nearby, it is sufficiently large to be stented, safety and duration of PCI are an issue: 2 stents

B) In all other conditions 1 stents and then evaluate

At present time the most accepted and applied strategy is provisional SB stenting, still there are a number of anatomical settings where the SB is large and diseased to require stenting as intention to treat
Treatment of Bifurcation Lesion with two stents

Baseline

Treatment
Treatment of Bifurcation Lesion with two stents

Final Result
A Typical Case for 2 stents

Baseline

Following Crush

12472/05
2 stents approach when the SB may be difficult to be wired
An approach for bifurcational lesions when using 2 stents as intention to treat

Bifurcational lesion with no disease proximal to the bifurcation or very short left main

Bifurcational lesion with main branch disease extending proximal to the bifurcation and side branch which has origin with about 90° angle

Bifurcational lesion with main branch disease extending proximal to the bifurcation and side branch which has origin with about 60° angle

V-Stent

T-Stent

Short-Mini Crush

Cross Section
Bifurcations

Keep It Open (KIO)

When the SB has ostial or diffuse disease AND when the SB is not suitable (too small) for stenting or clinically not relevant

6 Fr guiding catheter

1. Wire both branches
2. Dilate MB if needed
3. Stent MB and leave wire in the SB
4. Perform post-dilatation of the MB with jailed wire in the SB

Do not re-wire SB or postdilate or predilate SB
Example of Keep It Open (KIO)
Example of Keep It Open (KIO)

Balloon inflated on SB (Should not have been done)
Post Balloon inflation on SB
Example of Keep It Open (KIO)

Stenting of MB
Rewiring of SB with large dissection
Example of Keep It Open (KIO)

Perforation of SB attempting to gain true lumen

Final Result after cover stent on the MB
Jailed wires for side-branch protection
side branches are selectively wired

Baseline

Side-Branch protection
Cypher 3.0x33mm
Jailed wires for side-branch protection

After stent

Jailed wires

Cypher 2.5x18mm

Stent in Diagonal

12391/05
Jailed wires for side-branch protection
Conclusions

• LM bifurcation vs. other bifurcations

• Consider the importance of the SB: not every SB needs treatment and not every SB needs optimal result

• Immediate result is very important when implanting 2 stents