Bifurcation lesions

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Classification of bifurcation lesions

<table>
<thead>
<tr>
<th>Sanborn</th>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
<th>Type IV</th>
<th>Type V</th>
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</thead>
<tbody>
<tr>
<td>Safian</td>
<td>Type IA</td>
<td>Type IB</td>
<td>Type IIA</td>
<td>Type IIB</td>
<td>Type IIIA</td>
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<tr>
<td>Duke</td>
<td>Type A</td>
<td>Type B</td>
<td>Type C</td>
<td>Type D</td>
<td>Type E</td>
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<tr>
<td>Lefevre</td>
<td>Type 1</td>
<td>Type 2</td>
<td>Type 3</td>
<td>Type 4</td>
<td>Type 4a</td>
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<tr>
<td>Medina</td>
<td>1,1,1</td>
<td>1,1,0</td>
<td>0,1,1</td>
<td>0,1,0</td>
<td>0,0,1</td>
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<tr>
<td>Movahed</td>
<td>SL2V</td>
<td>BS2T</td>
<td>BL1sT</td>
<td>BS1sV</td>
<td>BS1sT</td>
</tr>
</tbody>
</table>

Medina Classification

- MB (Main Branch) - SB (Side Branch)
- Classifications: 1,1,1, 1,0,1, 0,1,1, 1,1,0, 1,0,0, 0,1,0, 0,0,1
Management of bifurcation lesions

Figure 2: MADS classification of different bifurcation treatment techniques.
Stenting of bifurcation lesions

1- Provisional
MV stenting + SB angioplasty
(Provisional) T stenting TAP, reverse internal crush, reverse culotte

2- Elective (Culotte, Crush, reverse crush, T, TAP, V stenting, SKS, DK crush(stent SB, inflation MV, first Kissing, stent MV, rewiring and FKB, POT).

How to choose among the various techniques?
- Bifurcation anatomy: (Angle (T or Y), severity of the ostial SB stenosis, extent of disease in the MV proximal to carina
- Operator experience

How to perform the procedure?
TAP BENCH TEST: angio

Step 1: stenting on MV with jailed guidewire on SB

Step 2: Kissing on MV and SB after rewiring of the SB (according to Provisional T-stenting strategy)
Step 3: Stent placement on the SB with uninflated balloon on MV ready for final kissing balloons

SB stent positioning is adjusted to ensure full coverage of the ostium by placing the proximal stent edge at the level of the proximal ostium border.

Step 4: Stent inflation on the SB with uninflated balloon on MV ready for final kissing balloons

The stent of the SB protrudes within the MV lumen only at the distal edge of SB ostium.
TAP BENCH TEST: angio

Step 5: The SB stent balloon is slightly pulled within the MV to perform kissing balloons inflation

The stent of the SB protrudes within the MV only at the distal edge of SB ostium

TAP BENCH TEST: angio

Step 6: Final kissing balloons of the bifurcation with the SB stent balloon and the MV balloon
The culotte technique

1. Wire both branches and predilate if needed.

2. Leave the wire in the straighter branch (MB) and deploy a stent in the more angulated branch (SB).

3. Rewire the unstented branch and dilate the stent struts to unjail the branch (MB).

4. Place a second stent into the unstented branch (MB) and expand the stent leaving some proximal overlap.

5. Re-cross the 2nd stent’s (MB) struts into the 1st stent (SB) with a wire and perform kissing balloon inflation.
The crush technique

1. Wire both branches and predilate if needed.
2. Advance the 2 stents. MB stent positioned proximally. SB stent will protrude only minimally into MB.
3. Deploy the SB stent.
4. Check for optimal result in the SB and then remove balloon and wire from SB. Deploy the MB stent crushing the MB stent.
5. Rewire the SB and perform high pressure dilatation.
6. Perform final kissing balloon inflation.

Step crush

The final result is basically similar to the one obtained with the “standard crush” technique, with the only difference being that each stent is advanced and deployed separately so that a 6 F guide may be used.
**Modified T technique**

1. Wire both branches and predilate if needed.
2. Advance the 2 stents. SB stent positioned with minimal protrusion into MB.
3. SB stent deployed at nominal pressure.
4. Check for optimal result in the SB and then remove balloon and wire from SB. Deploy the MB stent at high pressure.
5. Rewire the SB and perform high pressure dilatation.
6. Perform final kissing inflation following advancement of a balloon into the MB.

**V technique**

1. Wire both branches and predilate if needed.
2. Position two parallel stents covering both branches and extending into the MB. V: minimal protrusion into MB. SKS: double barrel into the MB.
3. Deploy one stent.
4. Deploy the second stent.
5. Some operators deploy the two stents simultaneously.
6. Perform high pressure single stent post-dilatation and medium pressure kissing inflation with short and non-compliant balloons.
Dedicated Bifurcation Stents

- Complete bifurcation “Y” stents
- Sidebranch access MB stents
- Sidebranch stents
- Specialty designs (e.g. for LM disease)
Complete Bifurcation “Y” Stent

BARD  AVE  Guidant  Cordis  MD

Sidebranch Access MB Stents

- ABT Frontier
- Invatec Twinrail
- Minvasys Nile
- BSC Petal
- Ymed Sidekick
- Trireme Medical (TMI)
- StentYs
ABT Frontier
_design characteristics_

- Main Branch (RX)
- Specially designed dual lumen tip
- Side Branch (OTW)
- Joining mandrel inserted through OTW inner member

- Single-Tip Delivery to avoid wire wrap
- Two Wires maintain access across both branches
- Kissing Balloon Deployment to minimize plaque shift
- Provisional T-Stent approach maintains options for additional treatment

Invatec Twin-Rail
_design summary_

- Stent Platform
  - Closed Cell design
  - Variable Stent Geometry
  - Adequate scaffolding of main vessel and side branch ostium

- Stent Delivery System
  - Double balloon design SDS
    - Main vessel balloon Ø 3.0mm and 3.5mm
    - Side branch balloon Ø 1.5mm
  - Double RX design
  - 6 F Guiding catheter compatible
Dedicated Bifurcation Stents

- Complete bifurcation “Y” stents
- Sidebranch access MB stents
- **Sidebranch stents**
- Specialty designs (e.g. for LM disease)

Capella Sideguard
Ostium Protection Device

- The Capella Sideguard’s trumpet-shaped design helps the stent conform to the ostium, allowing for complete stent-to-wall apposition.
- Its short length, self-expandable nitinol system and low-profile delivery system allow greater navigability even in very tortuous anatomy.
- It is currently a BMS, but the next generation will be DES.
Dedicated Bifurcation Stents

- Complete bifurcation “Y” stents
- Sidebranch access MB stents
- Sidebranch stents
- *Specialty designs (e.g. for LM disease)*

The Devax AXXESS system
Specialty design e.g. left main disease

AXXESS PLUS Concept

- The Axxess Plus stent is implanted at the level of the carina
- A successful implant will span the ostia of both branching vessels, indicated by the presence of one marker in each branch vessel

- Stents for the branch vessels are selected to match the length and diameter of the LAD and LCX
Imaging in bifurcation lesion

- Before procedure:
  MSCT: Angle, plaque, calcification, type of wires, pre dilation.
- During procedure:
  3D angio
  IVUS (bifurcation anatomy, stent optimization, wires problems …)
  OCT
  FFR

Take home massage

PCI of bifurcation lesion is technically challenging so keep it simple