Stenting: tips and tricks

Colin Berry
University of Glasgow
Scotland, UK

i2 Fellows Bootcamp • Tuesday, March 27, 2007
The presenter has received SIGNIFICANT research funding from Medtronic Inc. (Europe)
Learning objectives

• Primary / direct stenting

• Stenting in acute myocardial infarction

• Stenting tips and tricks in complex cases
Primary objective: avoid adverse outcomes

Baseline angiogram

Post mid-LAD stent
Tips and tricks for stenting: Guide catheter size

5 Fr simple procedures
‘+’ ve - direct stenting / reduced bleeding
‘-’ ve - ↑ risk air embolus / IVUS won’t go

6 Fr simple or complex procedures
may accommodate 2 balloons
(selected manufacturers)

≥7 Fr complex procedures
bifurcations, rotational atherectomy

blood loss - consider hemostasis valve
Stenting tips and tricks:
Guide catheter choice

**LCA**
- specialized guide catheters appropriate for artery: XB LAD vs. EBU or AL for Cx
- left main length (short = less aggressive guide)

**RCA**
- take-off *superior* vs *horizontal* vs *inferior*
- avoid side-hole catheters as pressure may falsely disguise wedging and vessel injury
## PTCA vs. primary stent?

In general, stents are superior

↓ Acute complications; ↓ restenosis

<table>
<thead>
<tr>
<th></th>
<th>PTCA</th>
<th>Primary Stent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anatomy</strong></td>
<td>Distal location</td>
<td>+ / -</td>
</tr>
<tr>
<td></td>
<td>Tortuous vessels</td>
<td>+ / -</td>
</tr>
<tr>
<td><strong>Lesion</strong></td>
<td>Non-calcified</td>
<td>+ / -</td>
</tr>
<tr>
<td></td>
<td>RD &lt; 2.0 mm</td>
<td>RD ≥ 2mm</td>
</tr>
<tr>
<td><strong>Distribution</strong></td>
<td>Small jeopardy score</td>
<td>&gt; Small</td>
</tr>
<tr>
<td><strong>Patient</strong></td>
<td>Low risk</td>
<td></td>
</tr>
</tbody>
</table>
PTCA technique

Long balloon, low inflation pressure, long inflation time

Standard balloon
2.5 x 20 mm

Distal lesion

Dilated @ 6 atmos
<table>
<thead>
<tr>
<th>Lesion characteristics</th>
<th>Direct stenting</th>
<th>Predilation + stenting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-ostial</td>
<td>Non-ostial</td>
<td>Ostial</td>
</tr>
<tr>
<td>Uniform</td>
<td>Uniform</td>
<td>Non-uniform</td>
</tr>
<tr>
<td>Non-calcified</td>
<td>Non-calcified</td>
<td>Calcified</td>
</tr>
<tr>
<td>Acute lesion (thrombectomy)</td>
<td>Acute lesion</td>
<td>Occluded</td>
</tr>
<tr>
<td>Simple</td>
<td>Simple</td>
<td>Complex (long, bifurcations)</td>
</tr>
</tbody>
</table>
Stenting in acute MI

- Ensure wire is endoluminal
- If thrombus present – aspirate; medicate
- Occluded artery - establish antegrade flow by predilation
- Direct stent only if lesion adequately visualized
- Post-dilate, only if necessary
Direct stenting in acute MI

Appropriate

Not appropriate
Tips and tricks: lesion preparation

PREDILATION

- Final balloon: lesion diameter 0.8 – 1.0 : 1
- Consider incrementally larger balloons, 1.5 – 2 mm followed by 2.5 – 3 mm

Adjunctive devices - rotational atherectomy for calcified lesions, including bifurcations

OBJECTIVE

- Achieve optimal lesion modification prior to stenting
### Which stent to use?

<table>
<thead>
<tr>
<th>Patient characteristics</th>
<th>BMS</th>
<th>DES</th>
</tr>
</thead>
<tbody>
<tr>
<td>No diabetes</td>
<td></td>
<td>Diabetes</td>
</tr>
<tr>
<td>Low-risk</td>
<td></td>
<td>Low bleeding risk</td>
</tr>
</tbody>
</table>

| Major co-morbidity (surgery intended, terminal cancer, ‘palliative’ PCI – CABG intended) |     |
|-------------------------------------------------------------------------------------|

<table>
<thead>
<tr>
<th>Lesion characteristics</th>
<th>RD ≥ 3.5 mm</th>
<th>*RD 2.75 – 3.5 mm</th>
</tr>
</thead>
</table>

*Ca^{2+} - achieve optimal stent deployment*

*SIRIUS: small < 2.75 & long > 18 mm vessels SCAI – ACC guidelines 2005; 2007*
### Risk of stent thrombosis

**TABLE II. Patient and Lesion Features Associated with Increased Risk of Drug-Eluting Stent Thrombosis**

<table>
<thead>
<tr>
<th>Patient</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>● Dual antiplatelet discontinuation</td>
<td></td>
</tr>
<tr>
<td>● Diabetes</td>
<td></td>
</tr>
<tr>
<td>● Acute coronary syndrome/myocardial infarction</td>
<td></td>
</tr>
<tr>
<td>● Low ejection fraction</td>
<td></td>
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<tr>
<td>● Renal failure</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Lesion</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>● Bifurcation</td>
<td></td>
</tr>
<tr>
<td>● Longer stent length</td>
<td></td>
</tr>
<tr>
<td>● Residual dissection</td>
<td></td>
</tr>
<tr>
<td>● Small stent diameter and/or severe under expansion</td>
<td></td>
</tr>
<tr>
<td>● Stent malapposition</td>
<td></td>
</tr>
</tbody>
</table>
Stent dimensions

- **Stent diameter**
  
  artery : stent ratio = 1 : 1.1
  
  do not oversize – acute complications
  
  plan possibility of post-dilation

- **Stent length**
  
  Lesion coverage
  
  DES – 1 - 2 mm proximal & distal to stent to ensure complete plaque coverage: normal to normal
  
  **IVUS to assess result**
Tips and tricks: stent deployment

Stent procedure

• Slow inflation to nominal pressure (avoid balloon dumb-bell effect)
• Short inflation (15 - 20 sec)
• Optimal inflation pressure > 14 A
• Analyze angiographic result in orthogonal views
Tips and tricks: stent deployment

Post-dilatation

- Select semi-compliant or non-compliant balloon
- Routine high-pressure (> 18 A) to ensure adequate stent expansion
- Stent under-expansion (focal or generalized) ? IVUS for stent assessment, especially if DES
Tips and tricks

Prevent stent malpositioning

- Stent motion prior to deployment can cause geographic miss (particularly in RCA)
- Partial inflation 1 – 3 A will lead to inflation of balloon at stent extremities prior to stent expansion.
- Therefore, small adjustments to the stent position can be made
Tips and tricks
Bifurcations

Provisional Stenting

1 stent is usually better than 2

Indications for 2 Stents

- **SB is an important artery** (large distribution, RD > 2 mm, dominant vessel) + **SB disease**

**CRUSH** – wire position in MB secure; quick, procedure, limiting ischemic time

**CULOTTE** – angle < 70°

**T** – angle > 70°
Can’t access side-branch access?
Tips and tricks: can’t access side-branch?

1. **Guide cath:** coaxial; correct configuration

2. **Guide-wire:** recross stent

   Wire access to side-branch (SB) stent: floppy, hydrophilic Whisper; steerable-catheter

3. **Balloon access to SB** – conventional balloon; if it doesn’t pass then use a low profile & short balloon ie 1.5 x 8 mm; or 1.25 mm

4. **Main branch post-dilation** at bifurcation

5. **Anchor technique** – advance MB balloon beyond bifurcation, inflate, then advance SB balloon

6. **Fixed wire system** – balloon on a wire
Anchor technique: successful side-branch access?
Side-branch access achieved
Kissing balloons optimizes final result
Stenting tips and tricks: achieve what you set out to do
Stenting: tips and tricks

Take Home Points: KEEP IT SIMPLE!

1. Lesion preparation
   for optimal stent deployment

2. Stent strategy
   think through the possible eventualities

3. What is best for the patient
   Restenosis: thrombosis ratio
   DES vs. BMS
   Risk of stent thrombosis? Duration of clopidogrel?
Thankyou for your attention
Primary objective: procedural success

Acute stent thrombosis
Stenting: tips and tricks
Importance of final kissing balloon dilation

Ormiston CCI 2004; 63: 332-336
Stenting: tips and tricks

Approach to Kissing Balloon inflations

- Individual balloon sizes should equal 2/3rds of proximal reference vessel diameter
- Final inflation should be an appropriately sized balloon in MB (especially for “Crush”)
- SB balloons should be deflated before or simultaneous with MB balloon
Stenting: tips and tricks

Bifurcation lesions

- T stents: angle < 90º, incomplete SB cover
- Crush technique: SB inflation then final kissing balloon inflation are essential
- ≤ 70° - kissing balloon’s are ideal
- > 70° - "" are inadequate stent expansion, therefore sequential post-dilatations followed by Kissing balloons
Stenting: tips and tricks

Kissing Balloons?

- Correct stent deformations, even when not-angiographically apparent
- Increase SB ostium minimum lumen area (> 5 mm$^2$)
- .. Leading to reduced SAT and reduced TLR
- May facilitate reintervention
Stenting: tips and tricks

Long lesions

• Stent length – independent predictor of intra-procedural stent thrombosis; sub-acute thrombosis, restenosis

• IVUS

• Anti-thrombotic treatments: IIbIIIa inhibitor, aspirin, clopidogrel
Reference vessel diameter

• Stent size: 1.1 : 1
  - undersizing acute long term complications
  - oversizing IPST, dissections
  - Smaller arteries – less likely to achieve 100% stent expansion or > 5 mm² stent area
• IVUS – to assess final minimum lumen area