How is FFR helpful to treat the Bifurcation lesions?

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CASE

M/50 Preoperative angiography, peripheral vascular disease
Pitfalls of anatomical evaluation

• Angiography
  - Single directional assessment
  - Variability in stenosis assessment
  - No validated criteria for side branch intervention
  - Not physiologic

• IVUS/OCT
  - Can not be performed in tight stenosis (ex. jailed SB)
  - No validated criteria for side branch intervention
  - Not physiologic
Ostial lesions

Angiographic severity ≠ Functional significance

<table>
<thead>
<tr>
<th>FFR</th>
<th>≥70% Angiographic Stenosis</th>
<th>50%–70% Angiographic Stenosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥0.75</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>&lt;0.75</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

Sensitivity 100%, specificity 55%, and test accuracy 60%.
Bifurcation lesion?
Bifurcation lesion?
M/50 Preoperative angiography, peripheral vascular disease
M/50 Preoperative angiography, peripheral vascular disease

Side branch angioplasty?
Do we have valid criteria for SB intervention?

Different criteria from different studies…..

- TIMI flow <3
- Dissection > A
- > 90% stenosis
- Threatened closure

Side branch angioplasty (%)

- **NORDIC**
  - Circulation 2006
- **BBB**
  - Eur Heart J 2008
- **CACTUS**
  - Circulation 2009
- **BBC-ONE**
  - Circulation 2010
How accurate is our assessment?

Variability of QCA and visual estimation in 20 jailed SB lesions

<table>
<thead>
<tr>
<th>% diameter stenosis</th>
<th>QCA</th>
<th>EBC experts</th>
<th>Korean experts</th>
<th>Trainee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intraclass correlation coefficient</td>
<td>0.518</td>
<td>0.314</td>
<td>0.404</td>
<td>0.155</td>
</tr>
</tbody>
</table>

Overall Visual Estimation: 0.262
Can anatomical evaluation predict the functional significant?

*FFR vs. % diameter stenosis in Jailed side branches*
Why discrepancy between anatomy and physiology?

- Various size, various amount of supplying myocardium
- Side branch ostial lesion is unique
  - Underlying plaque $\rightarrow$ Eccentric plaque
  - Remodeling $\rightarrow$ Negative remodeling
  - Mechanisms of luminal narrowing
    - Carina shift, plaque shift, stent struts, thrombus...
Anatomical severity vs. Functional significance

- IVUS vs. FFR in SB ostial lesions -
Anatomical severity vs. Functional significance

- IVUS vs. FFR in SB ostial lesions -

Fractional Flow Reserve

Minimum Lumen Area by IVUS

Fractional Flow Reserve

% Area stenosis by IVUS

r=0.19

P=0.3

r=0.01

P=0.98
M/50 Preoperative angiography, peripheral vascular disease
M/50 Preoperative angiography, peripheral vascular disease

Side branch stenting?
Side branch stenting?

Different criteria from different studies……

TIMI flow <3
Dissection > A
> 50% stenosis

Flow limiting dissection
≥ 75% stenosis

TIMI flow <3
Dissection > A
> 70% stenosis
Threatened closure

NORDIC
Circulation 2006

BBB
Eur Heart J 2008

CACTUS
Circulation 2009

BBC-ONE
Circulation 2010
Changes of side branch FFR after kissing ballooning

(Side branch balloon/artery ratio: 0.9 ± 0.1)

![Graph showing changes in side branch FFR after kissing ballooning. The graph indicates a significant increase from 0.65 ± 0.08 to 0.85 ± 0.06.](image)
Discrepancy between angiogram and FFR during PCI

Before PCI

After MB stenting

After kissing balloon
Functional outcome of Jailed side branches

Fractional flow reserve

Post-intervention 0.87 ± 0.06
Follow-up 0.87 ± 0.09

Koo BK. et al, Eur Heart J 2008
Functional outcome of Jailed side branches

11 month Follow-Up
FFR in Bifurcation lesion

• FFR-guided PCI for bifurcation lesion is safe and feasible.

• FFR is helpful from the beginning to the “fine tuning” of PCI procedures in bifurcation lesions.