Fractional Flow Reserve in Clinical Practice

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Fractional Flow Reserve

1. The idea
2. The evidence
3. Case examples
Original Article

Fractional Flow Reserve versus Angiography for Guiding Percutaneous Coronary Intervention

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Lesions warranting PCI identified

Randomized

FFR-Guided
PCI performed on indicated lesions only if FFR ≤ 0.80

Angio-Guided
PCI performed on indicated lesions

Primary Endpoint
Composite of death, MI and repeat revasc. (MACE) at 1 year

Secondary Endpoints
Individual rates of death, MI, and repeat revasc., MACE, and functional status at 2 years
## Adverse Events at 2 Years

<table>
<thead>
<tr>
<th></th>
<th>Angio-Guided n = 496</th>
<th>FFR-Guided n = 509</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total no. of MACE</strong></td>
<td>139</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td><strong>Individual Endpoints</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Death</td>
<td>19 (3.8)</td>
<td>13 (2.6)</td>
<td>0.25</td>
</tr>
<tr>
<td>Myocardial Infarction</td>
<td>48 (9.7)</td>
<td>31 (6.1)</td>
<td>0.03</td>
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<tr>
<td>CABG or repeat PCI</td>
<td>61 (12.3)</td>
<td>53 (10.4)</td>
<td>0.35</td>
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<tr>
<td><strong>Composite Endpoints</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Death or Myocardial Infarction</td>
<td>63 (12.7)</td>
<td>43 (8.4)</td>
<td>0.03</td>
</tr>
<tr>
<td>Death, MI, CABG, or re-PCI</td>
<td>110 (22.2)</td>
<td>90 (17.7)</td>
<td>0.07</td>
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</tbody>
</table>
2 Year Survival Free of MACE

- FFR-Guided
- Angio-Guided

730 days
4.5%
2 Year Survival Free of Repeat Revascularization

- FFR-Guided
- Angio-Guided

730 days 1.9%
2 Year Survival Free of MI

- **FFR-Guided**
- **Angio-Guided**

730 days
3.6%
2 Year Free of Death/MI

Survival Free from Death and MI

Days since Randomization

FFR-Guided

Angio-Guided

730 days
4.3%
## Other 2 Year Outcomes

<table>
<thead>
<tr>
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<th>Angio-Guided n = 496</th>
<th>FFR- Guided n = 509</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow-up (%)</td>
<td>92.7</td>
<td>94.5</td>
<td>0.31</td>
</tr>
<tr>
<td>Anti-anginal Medications, No.</td>
<td>1.2 ±0.8</td>
<td>1.2 ±0.7</td>
<td>0.66</td>
</tr>
<tr>
<td>Dual Antiplatelet Therapy (%)</td>
<td>33.6</td>
<td>31.4</td>
<td>0.49</td>
</tr>
<tr>
<td>Freedom from Angina, (%)</td>
<td>75.8</td>
<td>79.9</td>
<td>0.14</td>
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</tbody>
</table>
2 Year Outcome of Deferred Lesions

**FFR-guided group**
1329 lesions in 509 pts

513 lesions (38.6%) were deferred (FFR >0.80)
816 lesions were stented (FFR ≤0.80)

9 late MIs (1.8%)

- 1 due to a deferred lesion (0.2%)
- 8 due to ST/ISR or new lesions (1.6%)

53 revascs (10.4%)

- 16 due to a deferred lesion (3.2%)
- 37 due to ISR or new lesions (7.2%)
Latest PCI Guidelines

EU I

FFR-guided PCI is recommended for detection of ischaemia-related lesions when objective evidence of vessel-related ischaemia is not available.

US IIa

FFR can be useful to determine if PCI is warranted, particularly if the noninvasive test is absent or equivocal. It is reasonable to use FFR for assessing the need for PCI of intermediate lesions.

US III

FFR is not warranted to assess an angiographically significant stenosis if there is angina present and an unequivocally positive stress test in a concordant vascular distribution.

Circ 2009;120:2271
Patient 1:

- 57 year old man
- Exertional shortness of breath
- Myoview 16% ischemia infero-lateral
- Echo EF 45% posterior hypokinesis.
FFR 0.76 all the way to the ostium from distal LAD
Patient 2

- 54 year old man
- Angio 4 weeks ago, borderline LAD and severe LCX disease
- Class 3 angina despite medical treatment
- Plan LAD functional assessment
Patient 3: Save

- 44 year old smoker, DM, HTN
- Cardiac cath elsewhere and referred to the surgeons as three vessel disease.
- Surgeons correctly referred for FFR
Patient 4: less is more

- 71 man weeks of chest pain then prolonged rest pain. EKG LBBB, NSTEMI
- Echo inferior wall motion abnormality
- Severe LAD stenosis
- RCA borderline disease
Eternal: Should we graft or no

FFR 0.89
Patient 5

- 43 NSTEMI 2007 Cypher in circumflex.
- 2008 Occlusion of LAD: Xience stents
- Chest pains
- ETT reported as positive.
FFR 0.89
Patient 6

• 57 year old heavy smoker. DM.
• 2001 cypher stent to the LAD
• Recently seen by a friend who saw him at a wedding with chest pain of 1 month
Conclusion

- Outcome is improved if PCI or CABG is limited to borderline lesions that have a FFR <0.80 or
- Angiographic severe or
- Positive perfusion scan
- No downside of not intervening if FFR >0.80