CASE from South Korea

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F/56

- **Chief complaint:** Angina with recent aggravation, CCS II~III

- **Brief history:**
  # Stroke 5 years ago
  # Hypertension, Hypercholesterolemia under medication
  # Medical treatment for stable angina since 4 years ago

- **EKG, CXR:** normal
- **Echo:** normal LV function, no regional wall motion abnormality
F/56 Stable angina for 4 years with recent aggravation

What would you do?

- Medical treatment
- Exercise stress test (TMT)
- Dobutamine stress Echo
- Myocardial perfusion SPECT scan
- Coronary CT angiography
- Coronary angiography
F/56
Stable angina for 4 years with recent aggravation

[Conclusion] (CT coronary Angiography)

Atherosclerosis, **definite significant stenosis** in the coronary artery

**Proximal LAD**: mixed plaque with up to 50-60% stenosis
**Proximal and distal LCX**: multifocal stenosis up to 70%
**RCA os**: 40-50% stenosis with calcified plaque
**Is significant stenosis by CCTA “significant”?**

![Graphs showing diameter stenosis by QCA and QCT](image)

<table>
<thead>
<tr>
<th>FFR &lt;0.80 (n = 31)</th>
<th>True Positive</th>
<th>True Negative</th>
<th>False Positive</th>
<th>False Negative</th>
<th>kappa</th>
<th>Sensitivity, %</th>
<th>Specificity, %</th>
<th>Diagnostic Accuracy, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT coronary angiography, visual score</td>
<td>29</td>
<td>28</td>
<td>30</td>
<td>2</td>
<td>0.35</td>
<td>94 (58-100)</td>
<td>48 (35-61)</td>
<td>64 (54-74)</td>
</tr>
<tr>
<td>Quantitative CT coronary angiography</td>
<td>14</td>
<td>46</td>
<td>12</td>
<td>17</td>
<td>0.25</td>
<td>45 (28-63)</td>
<td>79 (69-90)</td>
<td>67 (58-77)</td>
</tr>
<tr>
<td>Conventional coronary angiography, visual score</td>
<td>17</td>
<td>36</td>
<td>22</td>
<td>14</td>
<td>0.16</td>
<td>55 (37-72)</td>
<td>62 (50-75)</td>
<td>60 (49-70)</td>
</tr>
<tr>
<td>Quantitative coronary angiography</td>
<td>17</td>
<td>41</td>
<td>18</td>
<td>13</td>
<td>0.25</td>
<td>57 (39-74)</td>
<td>69 (58-81)</td>
<td>65 (55-75)</td>
</tr>
</tbody>
</table>

Is significant stenosis by CCTA “significant”?

**DISCOVER FLOW study: Per-vessel analysis (n=159)**

- **True +**: 53 (33%)
- **False +**: 61 (38%)
- **True -**: 40 (25%)
- **False -**: 5 (3%)

**Sensitivity**: 91
**Specificity**: 40
**PPV**: 47
**NPV**: 89
**Accuracy**: 59

PPV: positive predictive value, NPV: negative predictive value

F/56 Stable angina with recent aggravation

Coronary CT angiography: Proximal LAD 50-60%, prx and dist LCX 70%, RCA os 40-50%

Myocardial ischemia? Which is ischemia-causing stenosis?

- Exercise was terminated at stage II (7METs) due to general weakness and chest pain
- **Conclusion**: Suggestive of positive test
Proportion of patients with adequate Exercise ECG
(n=1814)

- Adequate (635) 35%
- Submaximal (372) 21%
- Unable to exercise (374) 21%
- Uninterpretable (433) 24%

Thomas H. Marwick et al. 1994

Seoul National University Hospital
Cardiovascular Center
F/56 Stable angina with recent aggravation
Coronary CT angiography: Proximal LAD 50-60%, prx and dist LCX 70%, RCA os 40-50%
Exercise stress test: suggestive of positive

After 2 non-invasive tests, the patient was admitted for invasive angiography……

Which one is ischemia-causing stenosis?
Myocardial ischemia? Which is ischemia-causing stenosis?

F/56 Stable angina with recent aggravation
Coronary CT angiography: Proximal LAD 50-60%, prx and dist LCX 70%, RCA os 40-50%
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CAG: 1 vessel disease – proximal and distal LCX
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**FFR:** 2 vessel disease – proximal LCX and RCA os

→ Functionally complete revascularization with 2 drug-eluting stents
→ Patient’s symptom was improved
→ 6 mo after PCI, patient complained resting chest discomfort

[Stress image]  No significant perfusion decrease.
[Rest image]  No significant perfusion decrease.
[24hour delay image] Not done
[Compared with previous scan] No change
[LV wall motion]  Normal.
F/56 Stable angina with recent aggravation

6mo after PCI: Atypical discomfort

3 years before PCI: Stable angina CCS II

9 years before PCI: No symptom

Always negative, regardless of patient’s symptom!
Inaccuracy of perfusion SPECT in multi-vessel disease

143 severe 3-vessel disease patients and Tc-SPECT

- No Defect: 10%
- 1 Vessel Pattern: 36%
- 2 Vessel Pattern: 36%
- 3 Vessel Pattern: 18%

Per-Vessel analysis:

<table>
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<tr>
<th>FFR</th>
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<th>negative</th>
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<tr>
<td>&lt; 0.80</td>
<td>38</td>
<td>42</td>
</tr>
<tr>
<td>&gt; 0.80</td>
<td>24</td>
<td>97</td>
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PPV 61%, NPV 70%

Melikian, et al, JACC intv, 2009

Lima RS, et al JACC 2003
Which is the Best Modality for the Ischemia-guided Functional Angioplasty? SPECT, CT, Exercise ECG, CAG and FFR

F/56 Stable angina with recent aggravation

Myocardial SPECT: 9 years ago – no perfusion defect
Myocardial SPECT: 3 years ago – no perfusion defect
Coronary CT angiography: Proximal LAD 50-60%, prx and dist LCX 70%, RCA os 40-50%
Exercise stress test: suggestive of positive
CAG: 1 vessel disease – proximal and distal LCX
Myocardial SPECT 6 month after PCI: no perfusion defect

**FFR:** 2 vessel disease – proximal LCX and RCA os
  - Functionally complete revascularization with 2 drug-eluting stents
  - Patient’s symptom was improved
Which is the Best Modality for the Ischemia-guided Angioplasty?

: CCTA, Ex-stress test, MPI, IVUS, OCT, FFR……

“Ischemia-guided angioplasty”
Stenting of ischemic lesions and medical treatment of non-ischemic ones

Fractional Flow Reserve