Multivessel Coronary Artery Disease: CABG

Zürich, 10.06.2015
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Coronary Artery Ruptured Plaque

Pathological process with definite subsequent vascular changes most of them irreversible
CABG principles

Additional supply network
Stay away from the disease
Graft quality

1968
Dr. René Favaloro
1923 – 2000
Multiple Arterial Grafts

- Better than veins because
  - Live conduit (NO & PGI-2 secretion)
  - Less intimal proliferation
  - Less coronary – graft mismatch
  - Less prone to vasoconstriction (Leukotrienes)

Different configurations of arterial CABG
Comparative Effectiveness of Revascularization Strategies (Mortality)

Weintraub W, NEJM 366;16, 2012

CABG better than PCI on the long run

PCI

CABG

RR CABG 1.72

0.95

0.79

0.78

0.79
Reintervention at 3 years: 35% of PCI vs 5% CABG

New York Registry: 37,212 CABG and 22,102 PCI patients with > 2VD
Propensity matched for cardiac and non-cardiac co-morbidity risk

NEJM 2005
## Landmark Trial of CABG vs. PCI: SYNTAX

<table>
<thead>
<tr>
<th></th>
<th>@ 1 year (1)</th>
<th></th>
<th></th>
<th>@ 5 years (2)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>CABG</td>
<td>PCI</td>
<td>P</td>
<td>CABG</td>
<td>PCI</td>
<td>P</td>
</tr>
<tr>
<td>Cardiac Death</td>
<td>3.5</td>
<td>4.4</td>
<td>0.37</td>
<td>5.3</td>
<td>9.0</td>
<td>0.003</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>3.3</td>
<td>4.8</td>
<td>0.11</td>
<td>3.8</td>
<td>9.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cerebrovascular accident</td>
<td>2.2</td>
<td>0.6</td>
<td>0.003</td>
<td>3.7</td>
<td>2.4</td>
<td>0.09</td>
</tr>
<tr>
<td>Repeat revascularization</td>
<td>5.9</td>
<td>13.5</td>
<td>&lt;0.001</td>
<td>13.7</td>
<td>25.9</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Overall</td>
<td>12.4</td>
<td>17.8</td>
<td>&lt;0.002</td>
<td>26.9</td>
<td>37.3</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>ACC/AHA Recommendation</th>
<th>CABG n (%)</th>
<th>PCI n (%)</th>
<th>Medical Treatment, n (%)</th>
<th>None n (%)</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CABG</td>
<td>712 (53)</td>
<td>455 (34)</td>
<td>156 (12)</td>
<td>14 (1)</td>
<td>1337 (100)</td>
</tr>
<tr>
<td>PCI</td>
<td>124 (2)</td>
<td>5660 (94)</td>
<td>255 (4)</td>
<td>12 (&lt;1)</td>
<td>6051 (100)</td>
</tr>
<tr>
<td>CABG and PCI</td>
<td>84 (5)</td>
<td>1608 (93)</td>
<td>26 (2)</td>
<td>4 (&lt;1)</td>
<td>1722 (100)</td>
</tr>
<tr>
<td>Neither CABG or PCI</td>
<td>70 (6)</td>
<td>261 (21)</td>
<td>873 (71)</td>
<td>19 (2)</td>
<td>1223 (100)</td>
</tr>
</tbody>
</table>

The catheterization laboratory cardiologist was the “final source of recommendation” for 64% of these patients.
Does Prior PCI Increase the Risk of Subsequent CABG?

Hassan A et al. Am Heart J 2005;150:1026–1031

<table>
<thead>
<tr>
<th>Propensity matched groups</th>
<th>Prior PCI</th>
<th>No prior PCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients Nr.</td>
<td>919/919</td>
<td>919/5113</td>
</tr>
<tr>
<td>In hospital mortality</td>
<td>3.6%</td>
<td>1.7%</td>
</tr>
<tr>
<td>PCI as independent risk factor</td>
<td>OR 1.93</td>
<td>P=0.003</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Consecutive CABG patients with DM</th>
<th>Prior PCI</th>
<th>No prior PCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients Nr.</td>
<td>289</td>
<td>621</td>
</tr>
<tr>
<td>In hospital mortality (%)</td>
<td>7.8</td>
<td>2.9</td>
</tr>
<tr>
<td>MACE (%)</td>
<td>14.1</td>
<td>6.1</td>
</tr>
<tr>
<td>PCI as independent risk factor</td>
<td>OR 2.87</td>
<td>P=0.03</td>
</tr>
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</table>
Possible Adverse Effects of PCI

- Compromise of collateral flow
- Endothelial dysfunction after DES-PCI, both overlying the stent and downstream
- Exaggerated inflammatory changes in BMS
- Long term antiplatelets therapy
So Why is PCI Replacing CABG Against Best Evidence?

There are three reasons:

1. the cardiologist is the gatekeeper, and this may produce a conflict of interest in terms of self-referral
2. the disingenuous presentation and inappropriate application of results of randomized trials in highly selected and atypical groups to the whole population
3. the result of what happens when evidence-based medicine is challenged by a multibillion dollar industry

Will Cardiologists Achieve Better Results with a New Generation of Stents?

Most CAD is located in the proximal coronary arteries

- PCI can be effective in treating proximal CAD
- PCI does not offer protection against development of new disease proximal to, within, or immediately distal to the stent
- Actual type of stent becomes irrelevant.

- For CABG to mid-coronary vessels complexity of proximal disease irrelevant
- CABG also offer prophylaxis against new proximal disease

At the present time, unlikely
## Factors Affecting Global Strategy of Intervention in Stable Coronary Artery Disease

<table>
<thead>
<tr>
<th>Factors</th>
<th>Arguments</th>
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<tbody>
<tr>
<td>Anatomical</td>
<td>Single; Multivessel disease; Left Main; Chronic total occlusion; Proximal LAD; Syntax score</td>
</tr>
<tr>
<td>Clinical</td>
<td>Age; gender; Comorbidities; Fraility; LV function; Tolerance of meds; Clinical scores</td>
</tr>
<tr>
<td>Technical</td>
<td>Incomplete/Complete revascularization; Post CABG; Post PCI; Tortuosity/Calcifications</td>
</tr>
<tr>
<td>Local</td>
<td>Volume/Quality of Center/Operator; Patient preference; Local cost; Availability; Waiting list</td>
</tr>
</tbody>
</table>
Decision Tree for PCI vs CABG

Number of coronary arteries with relevant stenosis in proximal segments

1 or 2 vessel disease

- Proximal LAD involvement
  - No
    - PCI
  - Yes
    - Heart Team Discussion

3 vessel disease

- Syntax score <22
  - Low surgical risk
  - CABG
- Syntax score >22

ESC Guidelines EHJ (2013) 34, 2949–3003
Patients Do Not Want Operations

• No one wants any operation
• Patient’s decision on CABG depends on from whom and how information is presented
  – no patient wants ‘cracking the chest’ if the same effect can be achieved with PCI
• But most patients want the **best** treatment and many will accept an operation
  – if it increases survival by 5% (or reduces risk of mortality by 1/3) within 3-5 years
  – and allows them to get on with life without repeat interventions and the worry of failed stents
Bottom Line

We are bound to work together for the patient’s sake...

Meaning

Effective Heart Team Approach
Humanum fuit errare, diabolicum est per animositatem in errore manere

Aurelius Augustinus Hipponensis (Saint Augustin)  
A.D. 354 - 430

(To err is human, to persevere through haughtiness devilish)
Thank You