Left main Disease
5-YEAR CARDIAC MORTALITY (%)

**CORONARY ARTERIOGRAM**
- 7 VESSEL DIS. - NO ADDIT. NARR. (111)
- 2 VESSEL DISEASE (233) 38
- 3 VESSEL DISEASE (118) 54
- OBSTR. LEFT MAIN COR. ART. (37) 57

**LEFT VENTRICULAR ANGIOGRAM**
- NORMAL (253) 25
- LOCAL SCAR (145) 31
- ANEURYSM (50) 46
- DIFFUSE SCAR TISSUE (79) 69

**DURATION OF CHEST PAINS (MOS)**
- 0-12 (170) 23
- 13-72 (256) 29
- > 72 (117) 50

**DIABETES MELLITUS**
- NO DIABETES (570) 33
- CLINICAL DIABETES (20) 60

**ECG**
- REP. DIST. OR DIG. EFFECT (154) 34
- INFARCTION (119) 45
- CONDUCTION DISTURBANCE OR LVH (85) 64

*Figure 2*

Five-year cardiac mortality rates in relation to various parameters. Total number of cases in each category in parentheses. In the categories of the electrocardiogram one case with artificial pacemaker is excluded.
EXCEL Trial

• 1900 patients randomized to PCI (using Co-Cr EES) or CABG

• 70% LM OR 50-70% + FFR < 0.8, MLA < 6 mm², ischemia
So Why is there a problem?

• All trials report COMPOSITE outcomes and are POWERED for COMPOSITE outcomes

• Readers (we) are interested in individual real outcomes

• So why do we not do trials that report relevant individual outcomes?

• $$$$$ $?????
<table>
<thead>
<tr>
<th>Outcomes</th>
<th>EXCEL (PCI 948 vs. CABG 957)</th>
<th>NOBLE (PCI 592 vs. CABG 592)</th>
<th>IRIS–MAIN matched cohort (n = 670)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Event rate (at 3 years)</td>
<td>Event rate (at 5 years)</td>
<td>Event rate (at 3 years)</td>
</tr>
<tr>
<td></td>
<td>HR (95% CI)</td>
<td>HR (95% CI)</td>
<td>HR (95% CI)</td>
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<tr>
<td></td>
<td>P value</td>
<td>P value</td>
<td>P value</td>
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<tr>
<td>Death, MI, and stroke</td>
<td></td>
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<tr>
<td>PCI</td>
<td>15.4 1.00 (0.79–1.26)</td>
<td>13 1.47 (1.06–2.05)</td>
<td>12.3 1.08 (0.85–1.38)</td>
</tr>
<tr>
<td>CABG</td>
<td>14.7 Reference</td>
<td>22 Reference</td>
<td>12.0 Reference</td>
</tr>
<tr>
<td>Death</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCI</td>
<td>8.2 1.34 (0.94–1.91)</td>
<td>11.6 1.07 (0.67–1.72)</td>
<td>9.7 1.13 (0.85–1.50)</td>
</tr>
<tr>
<td>CABG</td>
<td>5.9 Reference</td>
<td>9.5 Reference</td>
<td>9.3 Reference</td>
</tr>
<tr>
<td>MI</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>PCI</td>
<td>8.0 0.93 (0.67–1.28)</td>
<td>6.9 2.88 (1.40–5.90)</td>
<td>2.2 1.38 (0.72–2.64)</td>
</tr>
<tr>
<td>CABG</td>
<td>8.3 Reference</td>
<td>1.9 Reference</td>
<td>1.4 Reference</td>
</tr>
<tr>
<td>Stroke</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>PCI</td>
<td>2.3 0.77 (0.43–1.37)</td>
<td>4.9 2.25 (0.93–5.48)</td>
<td>1.7 0.73 (0.42–1.28)</td>
</tr>
<tr>
<td>CABG</td>
<td>2.9 Reference</td>
<td>1.7 Reference</td>
<td>2.5 Reference</td>
</tr>
<tr>
<td>Revascularization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCI</td>
<td>12.9 1.72 (1.27–2.33)</td>
<td>16.2 1.50 (1.04–2.17)</td>
<td>10.6 4.67 (2.76–7.99)</td>
</tr>
<tr>
<td>CABG</td>
<td>7.6 Reference</td>
<td>10.4 Reference</td>
<td>2.1 Reference</td>
</tr>
<tr>
<td>MACCE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCI</td>
<td>23.1 1.18 (0.97–1.45)</td>
<td>28.9 1.48 (1.11–1.96)</td>
<td>20.9 1.65 (1.33–2.05)</td>
</tr>
<tr>
<td>CABG</td>
<td>19.1 Reference</td>
<td>19.1 Reference</td>
<td>13.8 Reference</td>
</tr>
</tbody>
</table>

Event rates are shown as Kaplan–Meier estimates (percentage of events). CI, confidence interval; HR, hazard ratio; MACCE, major adverse cardiac and cerebrovascular events; other abbreviations as in Table 1.
Comparative hazard ratios for death and stroke according to clinical studies. Hazard ratios [PCI vs. CABG (reference)] are shown for death from any causes (Panel A) and stroke (Panel B). CABG, coronary artery bypass graft surgery; CI, confidence interval; EXCEL, HR, hazard ratio; IRIS–MAIN, Interventional Research Incorporation Society—Left MAIN Revascularization; NOBLE, Nordic–Baltic–British Left Main Revascularization Study; PCI, percutaneous coronary intervention.

Comparative hazard ratios for MI and composite outcome according to clinical studies. Hazard ratios [PCI vs. CABG (reference)] are shown for MI (Panel A), and composite of death, MI, or stroke (Panel B). CABG, coronary artery bypass graft surgery; CI, confidence interval; EXCEL, Evaluation of XIENCE Everolimus-Eluting Stent Versus Coronary Artery Bypass Surgery for Effectiveness of Left Main Revascularization; HR, hazard ratio; IRIS–MAIN, Interventional Research Incorporation Society—Left MAIN Revascularization; NOBLE, Nordic–Baltic–British Left Main Revascularization Study; MI, myocardial infarction; PCI, percutaneous coronary intervention.
Problems with EXCEL and NOBLE

• EXCEL:

  • Use of SCAI (Old) definition of periprocedural myocardial infarction
    • Purely enzymatically driven
    • Felt to predict prognosis (did not in EXCEL)
    • Drove the primary COMPOSITE endpoint in favor of PCI

  • Higher use of “Off-pump” CABG (30%)
    • Higher mortality rates (8.8% vs 1.4%) in OPCAB both in EXCEL and in literature
    • Low incidence of multi-arterial grafts (24%) Do your surgeons use multiarterial grafts routinely?????
NOBLE SAYS PCI WORSE........
BUT........
• repeat revascularization was 6% more frequent (HR, 1.50; 95% CI, 1.04–2.17) in PCI compared to CABG group.

  BUT........the rates of repeat revascularizations in PCI were driven by de novo lesions rather than repeat left main intervention.

• The first 73 patients enrolled (10% of PCI arm) received first generation stents before BES was recommended as a primary stent.

• Unusually high incidence of CVA in PCI cohort!!!!!
<table>
<thead>
<tr>
<th>Study</th>
<th>Number of patients</th>
<th>Age (years)</th>
<th>Men (%)</th>
<th>2VD (%)</th>
<th>Distal LM score (%)</th>
<th>SYNTAX SCORE (%)</th>
<th>EuroSCORE (%)</th>
<th>DM (%)</th>
<th>EF (%)</th>
<th>DES (%)</th>
<th>IMA (%)</th>
<th>Follow-up (years)</th>
<th>Outcome</th>
<th>Results (PCI vs. CABG)</th>
<th>Max Follow-up</th>
<th>Death (%)</th>
<th>MI (%)</th>
<th>Revascularization (%)</th>
<th>Stroke (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LE MANS(^{[1]})</td>
<td>105</td>
<td>61±10</td>
<td>60</td>
<td>27</td>
<td>56</td>
<td>25.2±8.7</td>
<td>3.3±2.3</td>
<td>19</td>
<td>54±11</td>
<td>35</td>
<td>81</td>
<td>1</td>
<td>30% vs. 24.5</td>
<td>10</td>
<td>21.6% vs. 30.2%</td>
<td>8.7% vs. 10.4%</td>
<td>26.1% vs. 31.3%</td>
<td>4.3% vs. 6.3%</td>
<td></td>
</tr>
<tr>
<td>SYNTAX LM group(^{[3,4]})</td>
<td>705</td>
<td>66±10</td>
<td>76</td>
<td>61</td>
<td>58</td>
<td>30.2±12.7</td>
<td>3.9±2.9</td>
<td>26</td>
<td>1.4% of patients with EF &lt; 30%</td>
<td>100</td>
<td>97</td>
<td>1</td>
<td>15.8% vs. 15.6%</td>
<td>4 SYNTAX score 0–32: 7.9% vs. 6.1%</td>
<td>3.8% vs. 3.8%</td>
<td>14.1% vs. 14.1%</td>
<td>Combined: 12.8% vs. 14.6%</td>
<td>Combined: 8.2% vs. 4.8%</td>
<td>26.7% vs. 15.5%</td>
</tr>
<tr>
<td>PRECOMBAT(^{[5,6]})</td>
<td>600</td>
<td>62±10</td>
<td>76</td>
<td>75</td>
<td>67</td>
<td>24.4±9.4</td>
<td>2.6±1.8</td>
<td>34</td>
<td>62±8</td>
<td>100</td>
<td>94</td>
<td>1</td>
<td>8.7% vs. 6.7%</td>
<td>5 SYNTAX score 0–32: 7.9% vs. 6.1%</td>
<td>2.0% vs. 4.8%</td>
<td>11.4% vs. 5.5%</td>
<td>0.7% vs. 0.7%</td>
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<tr>
<td>EXCEL(^{[7]})</td>
<td>1,905</td>
<td>66±10</td>
<td>76</td>
<td>51</td>
<td>81</td>
<td>20.6±6.2</td>
<td>57±10</td>
<td>30</td>
<td>15±4</td>
<td>100</td>
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<td>3</td>
<td>15.4% vs. 14.7%</td>
<td>3 SYNTAX score 0–33: 8.2% vs. 8.3%</td>
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<tr>
<td>NOBLE(^{[8]})</td>
<td>1,184</td>
<td>66±10</td>
<td>80</td>
<td>44</td>
<td>81</td>
<td>22.5±7.5</td>
<td>15 (IQR 2–4)</td>
<td>60 (IQR 55–65)</td>
<td>100</td>
<td>93</td>
<td>5</td>
<td>23% vs. 19%</td>
<td>5 All-case death, nonprocedural MI, stroke, or repeat revascularization</td>
<td>12% vs. 9%</td>
<td>7% vs. 2%</td>
<td>16% vs. 10%</td>
<td>5% vs. 2%</td>
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</table>

Continuous variables presented as mean value and standard deviation except for EuroSCORE and ejection fraction in NOBLE trial which reported in median and interquartile range. Crush technique for bifurcation lesions was performed only in 6% of cases in SYNTAX trial and 4% of cases in NOBLE trial. CABG = coronary artery bypass graft; DES = drug-eluting stent; DM = diabetes mellitus; EF = ejection fraction; EXCEL = Everolimus-Eluting Stents or Bypass Surgery for Left Main Coronary Artery Disease; IMA = internal mammary artery; MACCE = major adverse cardiac and cerebrovascular events; MI = myocardial infarction; NOBLE = Nordic-Baltic-British left main revascularization; ST = stent thrombosis; STS = Society Thoracic of Surgeons; SYNTAX = Synergy between PCI with TAXUS and Cardiac Surgery; PCI = percutaneous coronary intervention; PRECOMBAT = Premier of Randomized Comparison of Bypass Surgery Versus Angioplasty Using Sirolimus-Eluting Stent (SES) in Patients With Left Main Coronary Artery Disease2VD = Two vessel disease.

\(^{[1]}\) MACCE was a secondary endpoint in LE MANS trial; \(^{[2]}\) Predefined and powered subgroup analysis in randomized clinical trial.
<table>
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<tr>
<th>EF</th>
<th>DES (%)</th>
<th>IMA (%)</th>
<th>Follow-up (years)</th>
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<td>5</td>
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<td>SYNTAX score 0–32: 6.1% vs. 18.6%</td>
<td>SYNTAX score 0–32: 1.4% vs. 3.9%</td>
<td></td>
</tr>
<tr>
<td>62±8</td>
<td>100</td>
<td>94</td>
<td>1</td>
<td>All-cause death, MI, stroke, or ischemia-driven target-vessel revascularization</td>
<td>8.7% vs. 6.7%</td>
<td>5</td>
<td>7.9% vs. 5.7%</td>
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Likely Mechanism Why CABG Better Long-term
My View

• CABG better for patients with high/diffuse plaque burden who are not able to DRASTICALLY alter life-style
  • Less affected by geographic progression
  • More upfront DOWNSIDE (PAIN, AF, INFECTION, ............)

• PCI with latest DES acceptable for VERY COMPLIANT PATIENT
  • Plant-based low carbohydrate diet.
  • Reduction of life related stresses (HaHa)

? Next generation BIOABSORBABLE STENT
PCI
- Less invasive and early recovery
- Early safety advantage
  (less MI, less stroke, or less major
  peri-procedural adverse events)
- Similar mortality

CABG
- Long-term durability
- Less revascularization
- Less spontaneous MI
- Similar mortality

Favor for PCI
- Urgent revascularization
- Serious comorbidity and high
  surgical risk (i.e., chronic lung
  disease, advanced age, disability
  from prior stroke, prior bypass
  surgery, or poor general performance)

Clinical Factors
- Clinical equipoise

Favor for CABG
- Low ejection fraction
- Longstanding diabetes
- Need for any concomitant
  cardiac surgery
- High-bleeding risk unable to
  comply with DAPT

Anatomical Factors
- Ostial or trunk LM disease
- Isolate LM disease (non-
  bifurcational or bifurcational)
- LM plus additional 1-vessel
  disease

- LM plus additional 2-vessel
  disease
- LM plus additional 3-vessel
  disease
- Combined complex anatomy
  not suitable for PCI (i.e., severe
  calcification or tortuosity, CTO,
  multiple/diffuse long lesions, or
  complex in-stent restenosis)

Recommendation

Each patient’s individual circumstances and preferences