Management of High-Risk CAD: Surgeons Perspective

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Conflict: Cardiac Surgeon!
High Risk CABG

77 year old with prior large anterior MI, dilated LV with EF 20%, mild MR, and recurrent heart failure symptoms.

Cath shows 3 vessel CAD.

Echo shows normal thickness throughout with akinesia of anterior wall.

OMT…. PCI…. Surgery
High Risk CABG

Patients are older and sicker

More advanced coronary disease

Progression of comorbidities

More extensive atherosclerosis

Operations are more complex

Difficult targets

Prior stenting

REDO - Sternal reentry

Limited conduits
Surgeons Perspective: All CABG are High Risk Now!

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Risk / Benefit assessment

**Viability:**
Significant burden of ischemia?

**Technical:**
Suitable targets to viable myocardium?
Risk assessment

*EuroScore*

*forget it!*

*STS Score*

*Mortality / QOL*
Viability assessment

Surface echo
  Contracting, full thickness

Thallium delayed resting imaging
  Mimics potassium in Na/K pump

FDG PET scanning
  Mimics glucose
  Most sensitive

Cardiac gated MR

Dobutamine viability study
  Least sensitive, most specific
Technical assessment

Good Targets
Use LIMA
Cardioplegia
Off vs On Pump?
Total Revasc
IABP
Go fast!
High risk CABG

When is a low EF too low?
Are all EF’s created equal?
Why do some patients benefit more than others and …
…..can we tell who may benefit more ?
Comparison of LVEF Before and After CABG

G1 - NON IMPROVED
\( \Delta \text{LVEF} < 5\% \)
\( N = 14 \)

G2 - IMPROVED
\( \Delta \text{LVEF} \geq 5\% \)
\( N = 15 \)

\( p = \text{NS} \)

\( p < 0.001 \)
### Clinical and Scintigraphic Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Improved Group (n = 15)</th>
<th>Nonimproved Group (n = 14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>63 ± 10</td>
<td>63 ± 12</td>
</tr>
<tr>
<td>Men/women</td>
<td>14/1</td>
<td>13/1</td>
</tr>
<tr>
<td>Coronary artery disease duration (yr)</td>
<td>8 ± 7</td>
<td>5 ± 5</td>
</tr>
<tr>
<td>Angina pectoris (score)</td>
<td>2.1 ± 1.4*</td>
<td>1.4 ± 3*</td>
</tr>
<tr>
<td>New York Heart Association functional score</td>
<td>1.5 ± 1.4</td>
<td>1.8 ± 1.2</td>
</tr>
<tr>
<td>Previous myocardial infarction (no.)</td>
<td>2 ± 1</td>
<td>2 ± 1</td>
</tr>
<tr>
<td>LVEF (%)</td>
<td>22 ± 5</td>
<td>25 ± 5</td>
</tr>
<tr>
<td>End-diastolic volume (ml)</td>
<td>193 ± 50</td>
<td>212 ± 49</td>
</tr>
<tr>
<td>LVEF rest/dobutamine</td>
<td>10 ± 5%†</td>
<td>6 ± 4%†</td>
</tr>
</tbody>
</table>

*p = 0.08; †p = 0.04."
LVEF with Dobutamine Infusion

DOBUTAMINE RESPONDERS

DOBUTAMINE NON RESPONDERS

*p < 0.001

*p < 0.01
Survival p CABG with Low LVEF
Survival post-CABG with Low LVEF
CASS Study

Medically Treated Patients CASS-3 Vessel Disease

Survival (%) vs Year

- EJECFR
  - 50-100
  - 35-49
  - 0-34

P < 0.0001
LOG RANK STAT = 343.474

Yearly Survival:
- NO. %
  - 3,005 100
  - 1,126 100
  - 627 100

Source: CASS Registry
RVEF & Survival

p CABG with Low LVEF
Is it EF in High risk CABG?

- 118 pts w/ EF mean 29%
- Dobutamine echo preop
- 20 pts had no postop improvement in EF despite good viability
- 13/20 had large anterior MI

• Hammermeister et al. Circulation 1979

• Of 733 pts w/ CAD, most powerful predictor of mortality was ESV and EDV
Post-MI LV Remodeling

- White, Circulation 1987
LVESI & High Risk CABG

STICH Trial

1000 patients with ischemic cardiomyopathy with EF<35%

Dominant anterior wall dysfunction amenable to Dor procedure

Multicenter randomized trial to CABG vs. CABG/Dor
Dor Procedure
STITCH Trial

Reduction in ESV by 19% (CAB/Dor) vs. 6% (CAB)

Similar improvement in NYHA and CCS class
No difference in all-cause mortality or cardiac hospitalization
Coronary-Artery Bypass Surgery in Patients with Left Ventricular Dysfunction

Eric J. Velazquez, M.D., Kerry L. Lee, Ph.D., Marek A. Deja, M.D., Ph.D., Anil Jain, M.D., George Sopko, M.D., M.P.H., Andrey Marchenko, M.D., Ph.D., Imtiaz S. Ali, M.D., Gerald Pohost, M.D., Sinisa Gradinac, M.D., Ph.D., William T. Abraham, M.D., Michael Yii, M.S., F.R.C.S., F.R.A.C.S., Dorairaj Prabhakaran, M.D., D.M., Hanna Szwed, M.D., Paolo Ferrazzi, M.D., Mark C. Petrie, M.D., Christopher M. O’Connor, M.D., Pradit Panchavinnin, M.D., Lilin She, Ph.D., Robert O. Bonow, M.D., Gena Roush Rankin, M.P.H., R.D., Robert H. Jones, M.D., and Jean-Lucien Rouleau, M.D., for the STICH Investigators*
STICH Revascularization Hypothesis

- 99 clinical sites in 22 countries
- Enrollment: July 2002 – May 2007
<table>
<thead>
<tr>
<th>Variable</th>
<th>MED (N=602)</th>
<th>CABG (N=610)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median (IQR), yrs</td>
<td>59 (53, 67)</td>
<td>60 (54, 68)</td>
</tr>
<tr>
<td>Female, %</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Diabetes, %</td>
<td>40</td>
<td>39</td>
</tr>
<tr>
<td>Prior Myocardial infarction, %</td>
<td>78</td>
<td>76</td>
</tr>
<tr>
<td>Prior Heart Failure within 3 months, %</td>
<td>95</td>
<td>94</td>
</tr>
<tr>
<td>Prior PCI or CABG, %</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>LVEF (%) — median</td>
<td>28</td>
<td>27</td>
</tr>
<tr>
<td>Multi-vessel disease (&gt;50%), %</td>
<td>91</td>
<td>91</td>
</tr>
<tr>
<td>Proximal LAD stenosis (&gt;75%), %</td>
<td>69</td>
<td>67</td>
</tr>
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All-Cause Mortality as Randomized

STICH

Mortality Rate vs. Years from Randomization:

- MED
- CABG

HR 0.86 (0.72, 1.04)
P = 0.123

Adjusted HR 0.82 (0.68, 0.99)
Adjusted P = 0.039
CV Mortality As Randomized

HR 0.81 (0.66, 1.00)
P = 0.050
Adjusted HR 0.77 (0.62, 0.94)
Adjusted P = 0.012
Death or CV Hosp As Randomized

- HR 0.74 (0.64, 0.85)
  - P < 0.001
- Adjusted HR 0.70 (0.61, 0.81)
  - P < 0.001

**STICH**

**Mortality or CV Hospitalization Rate**

- MED
- CABG

**Years from Randomization**

<table>
<thead>
<tr>
<th>MED</th>
<th>602</th>
<th>387</th>
<th>315</th>
<th>260</th>
<th>158</th>
<th>65</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>CABG</td>
<td>610</td>
<td>431</td>
<td>375</td>
<td>334</td>
<td>221</td>
<td>100</td>
<td>43</td>
</tr>
</tbody>
</table>
STICH

All Mortality as Treated \( \pm \text{Viability} !! \)

HR 0.70 (0.58 – 0.84)
P < 0.001

Mortality Rate vs. Years from Randomization

- MED
- CABG

MED: 592, 518, 464, 412, 297, 146, 74
CABG: 620, 548, 509, 482, 355, 182, 97
PCI or CABG : SYNTAX

All-cause Death/CVA/MI to 3 Years in 3VD Subset

### SYNTAX Trial – LM Study

**MACCE – 3 Year Follow-Up**

<table>
<thead>
<tr>
<th>SYNTAX Score</th>
<th>PCI</th>
<th>CABG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>18.0</td>
<td>23.0</td>
</tr>
<tr>
<td>Intermediate</td>
<td>23.4</td>
<td>23.4</td>
</tr>
<tr>
<td>High</td>
<td>37.3</td>
<td>21.2</td>
</tr>
<tr>
<td>(Mortality)</td>
<td>(13.4)</td>
<td>(7.6)</td>
</tr>
</tbody>
</table>

MACCE is defined as:
- All cause death
- Documented myocardial infarction (ARC definition)
- Cerebrovascular accident (CVA/stroke)
- Any repeat revascularization (PCI and/or CABG)

High Risk CAD

♥ CABG preferred:
More extensive disease
More severe LV dysfunction
Insulin-dependent diabetes
Chronic total occlusion
High Risk CABG
Factors to Consider

Comorbid conditions
LV & RV function
Viability ±
Technical Points
Team and Center Aspects
High Risk CABG

JUST DO IT !!