Presentation: Complete Versus Incomplete Revascularization of Patients with Multivessel Coronary Artery Disease

Speaker: Yader Sandoval, MD
Cardiovascular Disease Fellow
Minneapolis Heart Institute® at Abbott Northwestern Hospital & Hennepin County Medical Center

Date: Monday, October 5, 2015, 7:00 – 8:00 AM
Location: ANW Education Building, Auditorium A **New location this week only**

OBJECTIVES
At the completion of this activity, the participants should be able to:
1. Describe the distinct definitions of complete revascularization.
2. Discuss the evidence behind completeness of revascularization in stable multivessel CAD.
3. Discuss the evidence behind completeness of revascularization in unstable multivessel CAD.

ACCREDITATION
Physicians: This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of Allina Health and Minneapolis Heart Institute Foundation. Allina Health is accredited by the ACCME to provide continuing medical education for physicians. Allina Health designates this live activity for a maximum of 1.0 AMA PRA Category 1 Credit™. Physicians should only claim credit commensurate with the extent of their participation in the activity.

Nurses: This activity has been designed to meet the Minnesota Board of Nursing continuing education requirements for 1.2 hours of credit. However, the nurse is responsible for determining whether this activity meets the requirements for acceptable continuing education.

Others: Individuals representing other professional disciplines may submit course materials to their respective professional associations for 1.0 hours of continuing education credit.

DISCLOSURE STATEMENTS
Speaker: Dr. Sandoval has declared he does not have any conflicts of interest to disclose.
Planning Committee: Dr. Michael Miedema, and Eva Zewdie have declared that they do not have any conflicts of interest associated with the planning of this activity. Dr. Robert Schwartz declared the following relationships - stockholder: Cardiomind, Interface Biologics, Aritech, DSI/Transoma, InstyMeds, Intervalle, Medtronic, Osprey Medical, Stout Medical, Tricardia LLC, CoAptus Inc, Augustine Biomedical; scientific advisory board: Abbott Laboratories, Boston Scientific, MEDRAD Inc, Thomas, McNerney & Partners, Cardiomind, Interface Biologics; options: BackBeat Medical, BioHeart, CHF Solutions; speakers bureau: Vital Images; consultant: Edwards LifeSciences.
Complete Versus Incomplete Coronary Revascularization in Patients with Multivessel CAD

Yader Sandoval, M.D.
Co-Chief Cardiovascular Disease Fellow, HCMC/ANW.
Minneapolis, MN.
October 5, 2015.

DISCLOSURES
No disclosures relevant to this presentation.
OBJECTIVES

1. Define complete revascularization.
2. Benefits of complete revascularization.
3. Approach to complete revascularization in patients with *stable* multivessel CAD.
4. Approach to complete revascularization in patients with *unstable* multivessel CAD.

WHY DOES IT MATTER?

Multivessel CAD is *frequently* encountered.

Complete Revascularization: Origins.
Complete Revascularization: Origins.

“The concept of complete revascularization arose from the early studies on CABG surgery whereby some publications demonstrated that patients who were completely revascularized enjoyed a mortality benefit over those who were incompletely revascularized, thus setting the standard for the field of CABG.”

Circulation 2006; 114: 249.

Early CABG Studies: CR vs. IR

<table>
<thead>
<tr>
<th>CABG: CR vs. IR</th>
<th>2-year asymptomatic</th>
<th>5-year survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>CABG - IR</td>
<td>45%</td>
<td>84%</td>
</tr>
<tr>
<td>CABG - CR</td>
<td>75%</td>
<td>96%</td>
</tr>
</tbody>
</table>

Total n = 102 patients.

CR vs. IR: Survival among patients with severe angina, stratified according to LVEF.

6-year survival
CR: 69%
IR: 45%

Conclusion: CR in patients with 3V-CAD appears to most benefit those with severe angina and LV dysfunction.


“Complete revascularization has achieved the stature of a surgical mantra; its importance to superior long-term results after coronary artery bypass operations has become accepted as a truism.”

“Despite the mantra of complete revascularization, none of the current guidelines set out by the American or European cardiology societies formally discuss the issue in detail.”

Current guidelines emphasize the role of clinical angiographic variables such as the presence of diabetes mellitus, proximal LAD disease and LV dysfunction in deciding the optimal revascularization strategy.
4 References:
- 1983: observational (1,238)
- 1990: observational (n=867)
- 1992: observational (n=139)
- 1998: observational (n=757)

No clear recommendations.

Definitions of Complete Revascularization

Anatomical or Traditional

All disease arterial systems with vessel size >1.5 (2.0-2.25 mm for PCI) with at least one significant stenosis >50% receive a graft (or stent).

Definitions of Complete Revascularization

Functional

All ischemic myocardial territories are grafted (or stented); areas of old infarction with no viable myocardium are not required to be reperfused.


Definitions of Complete Revascularization

Physiology-based

All coronary lesions with fractional-flow reserve <0.75-0.80 receive a graft or stent.

### Definitions of Complete Revascularization

<table>
<thead>
<tr>
<th>Method</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anatomical or Traditional</strong></td>
<td>All disease arterial systems with vessel size $&gt;1.5$ (2.0-2.25 mm for PCI) with at least one significant stenosis $&gt;50%$ receive a graft (or stent).</td>
</tr>
<tr>
<td><strong>Functional</strong></td>
<td>All ischemic myocardial territories are grafted (or stented); areas of old infarction with no viable myocardium are not required to be reperfused.</td>
</tr>
<tr>
<td><strong>Numerical</strong></td>
<td>Number of distal anastomosis $&gt;$ number of diseased coronary segments/systems.</td>
</tr>
<tr>
<td><strong>Score-Based</strong></td>
<td>Scoring of stenosis in different vessels. Different weight given to different vessels according to number of myocardial segments supplied. A residual score of 0 is usually considered equivalent to CR.</td>
</tr>
<tr>
<td><strong>Physiology-based</strong></td>
<td>All coronary lesions with fractional-flow reserve $&lt;0.75$-$0.80$ receive a graft or stent.</td>
</tr>
</tbody>
</table>


### DEFINITION MATTERS

**Anatomical CR**: would required revascularization of all anatomical territories above % stenosis threshold.

PCI or CABG to lesions above % stenosis = CR
**Physiologic CR**: would require revascularization of ISCHEMIC lesions.

PCI or CABG to 2 lesions would equate CR.

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**Completeness of Revascularization**

**DEFINITIONS**

- **Anatomical**: 87%
- **Functional**: 5%
- **Numerical**: 5%
- **Multiple definitions**: 3%

Stenosis Severity and FFR


FAME study: Event-free Survival

absolute difference in MACE-free survival

Days since Randomization

Survival Free of MACE

30 days 2.9%
90 days 3.8%
180 days 4.9%
360 days 5.3%

FFR-guided

Angio-guided
FAME study: CONCLUSIONS

Routine measurement of FFR during DES-stenting in patients with multivessel disease is superior to current angiography guided treatment.

It improves outcome of PCI significantly

It supports the evolving paradigm of

“Functionally Complete Revascularization”, i.e. stenting of ischemic lesions and medical treatment of non-ischemic ones.

SYNTAX SCORE

Quantification and Impact of Untreated Coronary Artery Disease After Percutaneous Coronary Intervention

The Residual SYNTAX (Synergy Between PCI With Taxus and Cardiac Surgery) Score

Philippe Généreux, MD,*† Tullio Palmerini, MD,* Adriano Caiçara, MD, PhD,§ Gregg Rosner, MD,* Philip Green, MD,* Ovidiu Dressler, MD,* Ke Xu, PhD,* Helen Parise, PhD,* Roxana Mehran, MD,‡ Patrick W. Serruya,§ Gregg W. Stone, MD*

New York, New York; Montréal, Quebec, Canada; Bologna, Italy; São Paulo, Brazil; and Rotterdam, the Netherlands

Completeness of Revascularization Stratified by rSS According to bSS

CR $\rightarrow$ post-PCI rSS = 0

IR $\rightarrow$ rSS $\geq$ 1

Compared with the classic SS, the functional SYNTAX score, which is obtained by counting only ischemia-provoking lesions, has better reproducibility, has better prognostic value, and increases the proportion of patients with multivessel CAD who fall into the lowest risk for adverse events after PCI.

**Functional SYNTAX Score for Risk Assessment in Multivessel Coronary Artery Disease**

Integrating coronary anatomy complexity and ischemia.


Nam CW et al. FAME study investigators. JACC 2011; 58: 1211-8.
**COMPLETE REVASCULARIZATION: BENEFITS**

1. Mortality.
3. Repeat revascularization.
4. Ischemic reduction.

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**Reasons for Incomplete Revascularization**

- Diffuse small vessel disease.
- Massive coronary calcification.
- Vascular irregularities.
- Hemodynamic instability.
- Infarcted myocardium distal to the vessel.
- Chronic total occlusions.
- Untreated less than severe coronary stenosis (50-69%).
- IR patients tend to be sicker.

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CABG
PCI
SURGICAL REPORT

CR → on the immediate procedural outcomes

Circulation 2006; 114: 249: 55.

CR vs. IR: Overcoming CTOs

- CTOs remain the biggest and most important obstacle and technical challenge to achieve CR.
- CTOs are present in up to 20% of patients undergoing diagnostic coronary angiography.
- Historically, the success rate of crossing CTOs percutaneously approximates 60%.


Percutaneous Treatment Algorithm for Crossing Coronary CTOs

Meta-Analysis of Clinical Outcomes of Patients who Underwent PCI for CTOs

- Successful vs. Failed CTO PCI
- 1990 – 2014
- 25 studies
- Procedural success: 71%.
- Successful CTO PCIs are associated with a lower risk of death, stroke, CABG and less angina pectoris.

Long-Term All-Cause MORTALITY Long-Term MACE

IR associated w/ ADVERSE outcome
Registry studies suggest that IR is associated with an adverse impact on long-term mortality of pts w/ MVD who undergo PCI or CABG.

IR associated w/ SIMILAR outcomes
Studies indicate similar outcomes concerning myocardial infarction and mortality.


Studies have yielded conflicting results and no large multicenter randomized clinical trial has ever tested whether CR is superior to IR.

Records identified through database searching (n=6668)

Non-Human and/or Non-English (n=903)

Abstracts after non-human and non-English studies excluded (n=5765)

Studies excluded by non-relevant title (n=5231)

Potential relevant abstracts reviewed (n=534)

Excluded (n=425) (69 Studies have >1 reason for exclusion)
- STEMI: n=25
- Study design: n=52 (i.e. case reports, letters to the editor, review articles)
- CTO: n=16
- Outcomes of interest not reported: n=31
- Absence IR vs. CR comparison: n=369

Manuscripts included through database searching (n=24)

Full text articles assessed for eligibility (n=109)

Studies included in meta-analysis (n=35)

Excluded (n=85)
- Absence IR vs. CR comparison: n=37
- Event rates not reported: n=19
- STEMI or Shock population: n=4
- Small sample size: n=11
- CTO: n=1
- Only post-procedural outcomes: 1
- Reoperation: n=3
- Event rates reported for CR without distinguishing PCI/CABG: n=1
- Hybrid Procedures: n=1
- Duplicate dataset: n=3
- Multivessel PCI without mention of CR: n=1
- CR not defined: n=1
- Not a multivessel disease cohort: n=1

Records Identified Through Hand Searching (n=11)
From: Outcomes After Complete Versus Incomplete Revascularization of Patients With Multivessel Coronary Artery Disease: A Meta-Analysis of 89,883 Patients Enrolled in Randomized Clinical Trials and Observational Studies

CABG MORTALITY: CR vs. IR


PCI MORTALITY: CR vs. IR

Lower mortality in both PCI and CABG, independent of the study design and definition of CR.

- 30% ↓ in long-term mortality
- 22% ↓ in myocardial infarction.
- 26% ↓ in repeat coronary revascularization.

Observational studies

- 30% ↓ in mortality – I² = 78%
- 22% ↓ in myocardial infarction – I² = 44%
- 21% ↓ in repeat revascularization – I² = 76%

Randomized controlled trials

- 24% ↓ in mortality [I² = 0%]
- 28% ↓ in myocardial infarction [I² = 0%]
- 33% ↓ in repeat revascularization [I² = 0%]
Conclusions—Revascularization compared with MT had greater survival benefit (absolute and relative) in patients with moderate to large amounts of inducible ischemia. These findings have significant consequences for future approaches to post-single photon emission computed tomography patient management if confirmed by prospective evaluations. (Circulation. 2003;107:2900-2906.)
Frequency of Multivessel CAD:
- PCI + OMT: 73%
- OMT: 76%

Reduction of Ischemia with PCI vs OMT
COURAGE Trial Substudy

PCI + OMT (n=159)
33.3% with ≥5% ischemia reduction (p=0.0004)

OMT (n=155)
18.9% with ≥5% ischemia reduction

N=105 with mod - severe ischemia
PCI vs. OMT
76% vs. 52% reduction in ischemia
OBJECTIVES

1. Define complete revascularization.

2. Benefits of complete revascularization.

3. Approach to complete revascularization in patients with stable multivessel CAD.

4. Approach to complete revascularization in patients with unstable multivessel CAD.
CR vs. IR: Unstable Multivessel CAD

- **STEMI**
  - MV CAD: 40-65%
  - Class III recommendations against non-infarct artery PCI at the time of primary PCI in patients who are hemodynamically stable.


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<table>
<thead>
<tr>
<th>Table 2. Primary PCI in STEMI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COR</strong></td>
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<tr>
<td>-----------------------------</td>
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<tr>
<td>Ischemic symptoms &lt;12 h</td>
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<tr>
<td>Ischemic symptoms &lt;12 h and contraindications to fibrinolytic therapy irrespective of time delay from FMC</td>
</tr>
<tr>
<td>Cardiogenic shock or acute severe HF irrespective of time delay from MI onset</td>
</tr>
<tr>
<td>Evidence of ongoing ischemia 12 to 24 h after symptom onset</td>
</tr>
<tr>
<td>PCI of a noninfarct artery at the time of primary PCI in patients without hemodynamic compromise</td>
</tr>
</tbody>
</table>

After successful treatment of the culprit artery by PCI or fibrinolysis, revascularization of nonculprit arteries before hospital discharge in patients without clinical instability, with no evidence of recurrent or provokable ischemia, and with a normal LVEF was rated as inappropriate.

Patients with AMI may harbor multiple complex coronary plaques that are associated with adverse clinical outcomes. Plaque instability may be due to a widespread process throughout the coronary vessels, which may have implications for the management of acute ischemic heart disease.
Some have taken the view that stenosis in non-infarct arteries may cause serious adverse cardiac events that could be avoided by performing preventive PCI during the initial procedure.

Others have suggested that medical therapy with antiplatelet, lipid-lowering, and blood-pressure-lowering drugs is sufficient and the risk of preventive PCI outweigh the benefits.

### Complete vs. Culprit-Only Revascularization for Patients with Multivessel CAD Undergoing PPCI for STEMI: A Meta-Analysis of 46,234 patients – 26 studies.

#### Forest Plot of Long-Term Mortality Stratified by Study Method

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Complete CAD</th>
<th>Culprit-Only CAD</th>
<th>Odds Ratio</th>
<th>95% CI (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-Vessel PCI</td>
<td>836</td>
<td>836</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Culprit-Only PCI</td>
<td>836</td>
<td>836</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Odds Ratio (95%)</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Total deaths</td>
<td>836</td>
<td>836</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Total PCI</td>
<td>836</td>
<td>836</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Odds Ratio (95%)</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
</tbody>
</table>

#### In-Hospital Mortality Stratified by Immediate vs. Staged-Index Hospitalization PCI

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Complete CAD</th>
<th>Culprit-Only CAD</th>
<th>Odds Ratio</th>
<th>95% CI (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate PCI</td>
<td>836</td>
<td>836</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Staged PCI</td>
<td>836</td>
<td>836</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Odds Ratio (95%)</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Total deaths</td>
<td>836</td>
<td>836</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Total PCI</td>
<td>836</td>
<td>836</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Odds Ratio (95%)</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Randomized Trial of Preventive Angioplasty in Myocardial Infarction

David S. Wald, M.D., Joan K. Morris, Ph.D., Nicholas J. Wald, F.R.S., Alexander J. Chase, M.B., B.S., Ph.D., Richard J. Edwards, M.D., Liam O. Hughes, M.D., Colin Berry, M.B., Ch.B., Ph.D., and Keith G. Oldroyd, M.D., for the PRAMI Investigators


Cardiac Death, Nonfatal MI or Refractory Angina in patients having infarct-artery PCI

Hazard Ratio 0.35
(95% CI 0.21 to 0.58),
p<0.001
Risk Reduction 65%

<table>
<thead>
<tr>
<th>Preventive PCI</th>
<th>No Preventive PCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=234</td>
<td>n=231</td>
</tr>
<tr>
<td>21</td>
<td>53</td>
</tr>
</tbody>
</table>
Cardiac Death, Nonfatal MI or Refractory Angina in patients having infarct-artery PCI

Hazard Ratio 0.36
(95% CI 0.18 to 0.73),
p=0.004

Risk Reduction 64%

Preventive PCI n=234

No Preventive PCI n=231

Conclusion

Substantial benefit of Preventive PCI in patients with ST elevation myocardial infarction

65% ↓ cardiac death / nonfatal MI / refractory angina
64% ↓ cardiac death / nonfatal MI
**Trial design:** Participants with STEMI were randomized to complete revascularization (n = 150) vs. culprit-only PCI (n = 146).

**Results**
- Death, MI, heart failure, or ischemia-driven revascularization at 12 months: 10.0% of the complete revascularization group vs. 21.2% of the culprit-only group (p = 0.009)
- All-cause mortality: 1.3% vs. 4.1% (p = 0.14), respectively
- MI: 1.3% vs. 2.7% (p = 0.39), respectively
- Heart failure: 2.7% vs. 6.2% (p = 0.14), respectively
- Repeat revascularization: 4.7% vs. 8.2% (p = 0.2), respectively

**Conclusions**
- Among STEMI patients, complete revascularization appears beneficial at reducing major adverse cardiac events
- Benefit was primarily due to reduction in repeat revascularization procedures

Presented by Dr. Gershlick at ESC 2014

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**Complete revascularisation versus treatment of the culprit lesion only in patients with ST-segment elevation myocardial infarction and multivessel disease (DANAMI-3—PRIMULTI): an open-label, randomised controlled trial**

Thomas Engstrøm, Henning Kolbæk, Steffen Helqvist, Dan E. Hafsten, Lene Kløve, Lene Holmvang, Erik Jørgensen, Frants Pedersen, Kari Saarnamäki, Peter Clemmensen, Ole De Backer, Jan Rasmussen, Hans-Henrik Tilstø, Anton Bodvikskov, Jens Aaree, Svend-Egbert Jensen, Bent Rostrupgaard, Lars Køber, for the DANAMI-3—PRIMULTI Investigators*
DANAMI3-TRIAL PROGRAM

627 Multivessel disease
(>50% stenosis in non IRA > 2 mm suitable for PCI)

313 IRA PCI only
314 FFR guided complete revascularisation

313 received allocated intervention
0 did not receive allocated intervention

294 received allocated intervention
15 PCI failed or not feasible
1 died before PCI
2 refused subsequently
2 other reasons

313 Analysed on intention to treat basis
0 Lost to follow up

314 Analysed on intention to treat basis
1 lost to follow up (emigration)

FFR
(median of 2 days after initial PCI)

DANAMI3-PRIMULTI

DANAMI-3 – PRIMULTI

HR 0.56 (95% CI 0.38-0.83), p=0.004

Number at risk
Infarct-related artery only 313
Complete revascularisation 314

Follow-up (months)
0 12 24 36

**DANAMI-3 – PRIMULTI**

**Table:**

<table>
<thead>
<tr>
<th></th>
<th>Infarct-related artery only (n=313)</th>
<th>Complete revascularisation (n=314)</th>
<th>Hazard ratio (95% CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary endpoint*</td>
<td>68 (22%)</td>
<td>40 (13%)</td>
<td>0.56 (0.38-0.83)</td>
<td>0.004</td>
</tr>
<tr>
<td>All-cause mortality</td>
<td>11 (4%)</td>
<td>15 (5%)</td>
<td>1.40 (0.63-3.00)</td>
<td>0.43</td>
</tr>
<tr>
<td>Non-fatal reinfarction</td>
<td>16 (5%)</td>
<td>15 (5%)</td>
<td>0.94 (0.47-1.90)</td>
<td>0.87</td>
</tr>
<tr>
<td>Ischaemia-driven revascularisation</td>
<td>52 (17%)</td>
<td>37 (5%)</td>
<td>0.31 (0.18-0.53)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

**Graph:**

40% of repeat revascularizations were urgent.
Conclusions

Complete FFR guided revascularisation of multivessel disease in STEMI patients, staged within the index admission, reduced the primary endpoint of all cause death, reinfarction and repeat revascularisation.

40% of repeat revascularisations were urgent.

However, the reduction in the primary endpoint was driven by repeat revascularisations and not by hard endpoints.

Therefore, although complete revascularisation should be recommended, any condition that makes complex PCI unattractive may support a more conservative strategy of IRA PCI only.

<table>
<thead>
<tr>
<th>PRAMI (n=465)</th>
<th>CvLPRIT (n=296)</th>
<th>DANAMI-3-PRIMULTI (n=627)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesion criteria (% stenosis)</td>
<td>&gt;50%</td>
<td>&gt;70% or &gt;50% in 2 views</td>
</tr>
<tr>
<td>Timing for non-culprit lesion revascularization</td>
<td>Index procedure</td>
<td>Index procedure (2/3 patients) or staged within index admission</td>
</tr>
<tr>
<td>Primary endpoints</td>
<td>Cardiac death / MI / Refractory Ischemia</td>
<td>All-Cause Death / MI / Heart Failure / Ischemia-Driven Revascularization</td>
</tr>
<tr>
<td>Follow-up duration (months)</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>Primary endpoints</td>
<td>↓65%</td>
<td>↓53%</td>
</tr>
<tr>
<td>Cardiac Death</td>
<td>No difference</td>
<td>No difference</td>
</tr>
<tr>
<td>Repeat MI</td>
<td>↓</td>
<td>No difference</td>
</tr>
<tr>
<td>Revascularization</td>
<td>↓</td>
<td>No difference</td>
</tr>
<tr>
<td>Complications (stroke / major bleeding / CIN)</td>
<td>No difference</td>
<td>No difference</td>
</tr>
</tbody>
</table>

Qamar A, Bhatt DL. Prog Cardiovasc Dis 2015.
"We can no longer assume that secondary lesions in acute myocardial infarction are innocent until proven guilty."

Mauri L. NEJM 2013; 369: 1166.
Conclusions

1. Data continues to emerge on the potential benefits of complete revascularization procedures on clinical outcomes.

2. These benefits are independent of revascularization modality and biologically plausible given our current knowledge of the benefits of ischemia reduction.

3. A heart team approach should carefully evaluate the angiogram and estimate the likelihood of achieving CR with either revascularization modality if the clinical situation allows.

4. In patients presenting with ACS the paradigm is shifting toward complete revascularization.
5. Most **barriers (CTOs)** to achieving CR are not insurmountable.

6. **Functional complete revascularization**
   - FFR guided strategy
   - Revascularization of ischemic lesions
   - Medical treatment of non-ischemic lesions.

**Conclusions**

**Thank you for your attention.**