Primary PCI 2018

Georgios M. Georgiou MD, FESC, FACC
Interventional cardiologist
Apollonio Private Hospital
Nicosia, Cyprus
Disclosure: I have no actual or potential conflict of interest in relation to this presentation
Revascularization in ST Elevation Myocardial Infarction

- Epidemiology
- Time delays
- Selection of reperfusion strategy
- Culprit-only vs multivessel PCI
- Procedural/technical aspects
- Periprocedural pharmacotherapy
30-day (%) cardiovascular mortality of STEMI

Epidemiology
STEMI/100,000 inhabitants/year

In-Hospital mortality (%) of STEMI (treated with PPCI/thrombolysis/no reperfusion)
Influencing factors of mortality in STEMI patients

- Advanced age
- Killip class
- Time delay to treatment
- Treatment strategy
- Presence of EMS-based STEMI networks
- History of myocardial infarction
- Diabetes mellitus
- Renal failure
- Number of diseased coronary arteries
- LVEF
Revascularization in ST Elevation Myocardial Infarction

- Epidemiology
- Time delays
- Selection of reperfusion strategy
- Culprit-only vs multivessel PCI
- Procedural/technical aspects
- Periprocedural pharmacotherapy
Time delays in STEMI treatment

ESC guidelines on STEMI, 2017
FITT-STEMI trial (Feedback Intervention and Treatment Times in ST-Elevation Myocardial Infarction)
FITT-STEMI trial (Feedback Intervention and Treatment Times in ST-Elevation Myocardial Infarction)

In shock without OHCA, every 10 min treatment delay resulted in 3.3 additional deaths per 100 PCI-treated patients, and in 1.3 additional deaths after out-of-hospital cardiac arrest without cardiogenic shock.

Revascularization in ST Elevation Myocardial Infarction

- Epidemiology
- Time delays
- Selection of reperfusion strategy
- Culprit-only vs multivessel PCI
- Procedural/technical aspects
- Periprocedural pharmacotherapy
Primary PCI vs Fibrinolysis:
Short-term clinical outcomes (4–6 weeks)

(meta-analysis of 23 randomized studies)

(Combined endpoint: death+ re-MI+ stroke)
Fibrinolytic Therapy Trialists' (FTT) Collaborative Group

(9 RCT, 58,600 pts)

![Graph showing mortality rates](image)

2p<0.00001

Key treatments of STEMI 1995-2014

SWEDHEART registry
In-hospital- and 1-year mortality of STEMI

SWEDHEART registry

Revascularization in ST Elevation Myocardial Infarction

- Epidemiology
- Time delays
- Selection of reperfusion strategy
- Culprit-only vs multi-vessel PCI
- Procedural/technical aspects
- Periprocedural pharmacotherapy
Culprit-only vs multivessel revascularization

**RCTs comparing revascularization vs medical therapy**
- PRAMI trial
- CvLPRIT trial

**RCTs using FFR**
- DANAMI-3 -PRIMULTI trial
- COMPARE-ACUTE trial

**RCT in cardiogenic shock**
- CULPRIT-SHOCK trial
Aggressive (MV-PCI immediately)

Intermediate (IRA-PCI staged)

Conservative

Revasc. based on angio

Revasc. based on FFR

Revasc. based on angio

Revasc. based on FFR

Revasc. based on ischemia/symptoms

PRAMI and CvLPRIT

COMPARE-ACUTE

DANAMI-3 - PRAMI-LE
Preventive angioplasty in Acute Myocardial Infarction (PRAMI) trial

PRAMI – cardiac death, non fatal MI, refractory angina

PCI at the Time or Primary PCI

<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>

HR 0.35, p<0.001 (95% CI 0.21-0.58)

65% risk reduction
Complete vs Lesion only PRImary PCI Trial (CvLPRIT)

CvLprit – total mortality, recurrent MI, heart failure, revas

Hazard Ratio (95% CI): 0.45 (0.24, 0.84)
P = 0.009

MACE (%) vs Month

Number at risk:
- Complete: 150, 131, 129, 128, 125, 108, 73
- IRA Only: 146, 122, 118, 116, 111, 98, 68
COMPARE-ACUTE trial

**Trial design**

- **Acute STEMI patients undergoing primary PCI**
- **885 stable multivessel STEMI pts. randomized**
  - **1:2 randomization**

- **295 pts**
  - Acute FFR-guided complete revascularization of non-IRA lesions

- **590 pts**
  - Infarct related artery only treatment + blinded FFR of non-IRA lesions
  - 45 day treatment window for elective clinically indicated PCI

Follow-up at 30 days, 12, 24 and 36 months
# Primary outcome and its components

* MACCE = the composite of all-cause mortality, non-fatal myocardial infarction, any revascularization and cerebrovascular events.

<table>
<thead>
<tr>
<th></th>
<th>FFR guided Complete Revascularization (n=295)</th>
<th>Infarct Artery Only treatment (n=590)</th>
<th>HR</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary endpoint</strong></td>
<td>Number of events (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MACCE* (any first event)</td>
<td>23 (7.8%)</td>
<td>121 (20.5%)</td>
<td>0.35</td>
<td>0.22 – 0.55</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Death, all cause</td>
<td>4 (1.3%)</td>
<td>10 (1.7%)</td>
<td>0.80</td>
<td>0.25 – 2.56</td>
<td>0.70</td>
</tr>
<tr>
<td>Cardiac</td>
<td>3 (1.0%)</td>
<td>6 (1.0%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myocardial infarction (MI)</td>
<td>7 (2.4%)</td>
<td>28 (4.7%)</td>
<td>0.50</td>
<td>0.22 - 1.13</td>
<td>0.10</td>
</tr>
<tr>
<td>Spontaneous</td>
<td>5 (1.6%)</td>
<td>17 (2.9%)</td>
<td>0.59</td>
<td>0.22 – 1.59</td>
<td>0.29</td>
</tr>
<tr>
<td>Peri-procedural</td>
<td>2 (0.6%)</td>
<td>11 (1.9%)</td>
<td>0.36</td>
<td>0.08 – 1.64</td>
<td>0.19</td>
</tr>
<tr>
<td>Revascularization</td>
<td>18 (6.1%)</td>
<td>103 (17.5%)</td>
<td>0.32</td>
<td>0.20 – 0.54</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PCI</td>
<td>15 (5.1%)</td>
<td>98 (16.6%)</td>
<td>0.37</td>
<td>0.24 – 0.57</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CABG</td>
<td>3 (1.0%)</td>
<td>5 (0.8%)</td>
<td>1.20</td>
<td>0.29 – 5.02</td>
<td>0.80</td>
</tr>
<tr>
<td>Cerebrovascular event</td>
<td>0 (0.0%)</td>
<td>4 (0.7%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DANAMI-3 PRIMULTI trial

Individual components of primary endpoint

Composite

Revascularisation

Non fatal MI

All cause death
2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation

The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC)

Non-IRA strategy

Routine revascularization of non-IRA lesions should be considered in STEMI patients with multivessel disease before hospital discharge.
Culprit-shock trial

Primary Study Endpoint
All-Cause Mortality or Renal Replacement Therapy

Relative risk 0.83; 95% confidence interval 0.71-0.96; P=0.01

Number at risk:
- Culprit lesion only PCI: 344
- Immediate multivessel PCI: 341

Days after randomization
- Culprit lesion only PCI:
  - Days: 0, 5, 10, 15, 20, 25, 30
  - Numbers: 219, 207, 198, 192, 189, 184

- Immediate multivessel PCI:
  - Days: 0, 5, 10, 15, 20, 25, 30
  - Numbers: 190, 172, 162, 156, 153, 152

All-Cause Mortality

Relative risk 0.84; 95% confidence interval 0.72-0.98; P=0.03

Number at risk:
- Culprit lesion only PCI: 344
- Immediate multivessel PCI: 341

Days after randomization
- Culprit lesion only PCI:
  - Days: 0, 5, 10, 15, 20, 25, 30
  - Numbers: 237, 228, 211, 203, 198, 193

- Immediate multivessel PCI:
  - Days: 0, 5, 10, 15, 20, 25, 30
  - Numbers: 229, 197, 179, 170, 166, 165
Culprit-shock trial

Multivessel PCI in Shock - Guideline Evolution

ESC STEMI Guidelines 2017 → Revascularization Guidelines 2018

STEMI (NSTEMI), Cardiogenic Shock

2017

2018
Revascularization in ST Elevation Myocardial Infarction

- Epidemiology
- Time delays
- Selection of reperfusion strategy
- Culprit-only vs multi-vessel PCI
- Procedural/technical aspects
- Periprocedural pharmacotherapy
Radial versus femoral access for coronary angiography and intervention in patients with acute coronary syndromes (RIVAL)

Composite primary outcome of death, myocardial infarction, stroke, or non-CABG related major bleeding

Figure 3: Forest plot of prespecified subgroup analyses of the composite primary outcome
Access route

Updated meta-analysis of trials in patients with ACS

Figure 5: Forest plot of the updated meta-analyses of trials in patients with acute coronary syndromes
COMFORTABLE-AMI trial

Primary end-point: composite of cardiac death, TV-reinfarction and ischemia-driven TLR at 1-year
Thrombus aspiration in STEMI
Individual patient meta-analysis: Thrombectomy Trialists Collaboration

Table 2. Outcomes for Thrombus Aspiration Versus PCI Alone

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Thrombus Aspiration (n=9155), n (%)</th>
<th>PCI Alone (n=9151), n (%)</th>
<th>HR</th>
<th>95% CI</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary outcome</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiovascular death at 30 d</td>
<td>221 (2.4)</td>
<td>262 (2.9)</td>
<td>0.84</td>
<td>0.70–1.01</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>Key safety outcome</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke or TIA at 30 d*</td>
<td>66/8518 (0.8)</td>
<td>46/8476 (0.5)</td>
<td>1.43</td>
<td>0.98–2.1</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>Other outcomes at 30 d</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All-cause death</td>
<td>232 (2.5)</td>
<td>273 (3.0)</td>
<td>0.85</td>
<td>0.71–1.01</td>
<td>0.06</td>
</tr>
<tr>
<td>MI</td>
<td>96 (1.0)</td>
<td>104 (1.1)</td>
<td>0.92</td>
<td>0.70–1.21</td>
<td>0.55</td>
</tr>
<tr>
<td>Congestive heart failure†</td>
<td>141/8653 (1.6)</td>
<td>128/8648 (1.5)</td>
<td>1.10</td>
<td>0.87–1.40</td>
<td>0.44</td>
</tr>
<tr>
<td>Target vessel revascularization</td>
<td>215 (2.3)</td>
<td>239 (2.6)</td>
<td>0.90</td>
<td>0.74–1.08</td>
<td>0.24</td>
</tr>
<tr>
<td>Cardiovascular death, MI, cardiogenic shock, congestive heart failure,</td>
<td>604/8653 (7.0)</td>
<td>654/8648 (7.6)</td>
<td>0.92</td>
<td>0.82–1.03</td>
<td>0.14</td>
</tr>
<tr>
<td>stent thrombosis, or target vessel revascularization†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Outcomes at 1 y</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiovascular death</td>
<td>343 (3.7)</td>
<td>380 (4.2)</td>
<td>0.90</td>
<td>0.78–1.04</td>
<td>0.15</td>
</tr>
<tr>
<td>All-cause death</td>
<td>426 (4.7)</td>
<td>464 (5.1)</td>
<td>0.91</td>
<td>0.80–1.04</td>
<td>0.18</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>233 (2.5)</td>
<td>239 (2.6)</td>
<td>0.97</td>
<td>0.81–1.16</td>
<td>0.73</td>
</tr>
<tr>
<td>Congestive heart failure†</td>
<td>268/8653 (3.1)</td>
<td>258/8648 (3.0)</td>
<td>1.04</td>
<td>0.87–1.23</td>
<td>0.68</td>
</tr>
<tr>
<td>Target vessel revascularization</td>
<td>495 (5.4)</td>
<td>504 (5.5)</td>
<td>0.97</td>
<td>0.86–1.10</td>
<td>0.68</td>
</tr>
<tr>
<td>Stroke or TIA*</td>
<td>128/8055 (1.6)</td>
<td>103/7990 (1.3)</td>
<td>1.24</td>
<td>0.95–1.61</td>
<td>0.11</td>
</tr>
</tbody>
</table>
Primary PCI in 2018

- Epidemiology
- Time delays
- Selection of reperfusion strategy
- Culprit-only vs multi-vessel PCI
- Procedural/technical aspects
- Periprocedural pharmacotherapy
### Anticoagulant therapy

<table>
<thead>
<tr>
<th>Therapy Description</th>
<th>Class</th>
<th>Level</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticoagulation is recommended for all patients in addition to antiplatelet therapy during primary PCI.</td>
<td>I</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Routine use of UFH is recommended.</td>
<td>I</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>In patients with heparin-induced thrombocytopenia, bivalirudin is recommended as the anticoagulant agent during primary PCI.</td>
<td>I</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Routine use of enoxaparin i.v. should be considered.</td>
<td>IIa</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Routine use of bivalirudin should be considered.</td>
<td>IIa</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Fondaparinux is not recommended for primary PCI.</td>
<td>III</td>
<td>B</td>
<td></td>
</tr>
</tbody>
</table>

---

**Antithrombotic therapy**

**Periprocedural and post-procedural antithrombotic therapy** in patients undergoing primary percutaneous coronary intervention

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A potent P2Y₁₂ inhibitor (prasugrel or ticagrelor), or clopidogrel if these are not available or are contraindicated, is recommended before (or at least at the time of) PCI and maintained over 12 months, unless there are contraindications such as excessive risk of bleeding.¹⁸⁶,¹⁸⁷</td>
<td>I</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Aspirin (oral or i.v. if unable to swallow) is recommended as soon as possible for all patients without contraindications.²¹³,²¹⁴</td>
<td>I</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>GP IIb/IIIa inhibitors should be considered for bailout if there is evidence of no-reflow or a thrombotic complication.</td>
<td>IIa</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Cangrelor may be considered in patients who have not received P2Y₁₂ receptor inhibitors.¹⁹²-¹⁹⁴</td>
<td>IIb</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>2014</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>----------------------------------------</td>
<td>----------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Population</strong></td>
<td>838,897 (2011 Census)</td>
<td>868,000</td>
<td></td>
</tr>
<tr>
<td><strong>Country surface area</strong></td>
<td>9,251 km²</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GDP per capita</strong></td>
<td>$26,389</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rate of STEMI</strong></td>
<td>74/100,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rate of STEMI mortality</strong></td>
<td>3.8%</td>
<td>3.1%</td>
<td></td>
</tr>
<tr>
<td><strong>Usage rate of thrombolysis</strong></td>
<td>74.4%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td><strong>Rate of no reperfusion therapy</strong></td>
<td>24%*</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td><strong>PCI per million</strong></td>
<td>1600 (approximately)</td>
<td>1850 (approximately)</td>
<td></td>
</tr>
<tr>
<td><strong>p-PCI per million</strong></td>
<td>12</td>
<td>590</td>
<td></td>
</tr>
<tr>
<td><strong>% of p-PCI in STEMI patients</strong></td>
<td>1.6%</td>
<td>88%</td>
<td></td>
</tr>
<tr>
<td><strong>No. of cath labs</strong></td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td><strong>No. of 24/7 cath labs</strong></td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td><strong>Average distance to cath lab</strong></td>
<td>(max distance 60 min)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>No. of ambulances</strong></td>
<td>59 (24 crews)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Average no. of ambulances with ECG</strong></td>
<td>32 (12-lead ECG)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Availability of helicopters</strong></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>No. of patients that call EMS</strong></td>
<td>25%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Cyprus (2014)

Public Hospital with 24/7 cath lab

Private Hospitals with 24/7 cath lab

% of p-PCI in STEMI patients: 88%
Treatment of STEMI in Cyprus (2009-2014)

- **2009**
  - No reperfusion: 24
  - Thrombolysis: 1.6
  - P-PCI: 74.4

- **2014**
  - No reperfusion: 9
  - Thrombolysis: 3
  - P-PCI: 88
Thank you for your attention