The predictive value of global longitudinal strain on clinical outcome in patients with ST-segment elevation myocardial infarction and preserved systolic function

Bendary A * MD, Tawfik W MD, Mahros M MD, Salem M MD,PhD

Leading author and presenter ...

Ahmed Bendary, MD
Background

- Not all patients with preserved LVEF after STEMI are equal when it comes to short and long term outcome.

- Measurement of LVEF following STEMI has long been a cornerstone step for risk stratification process that helps to guide treatment decisions and other secondary preventive measures.

- Patients with preserved LVEF following STEMI are always left with weak and ambiguous treatment recommendations in the guidelines.

- HOWEVER, LVEF lacks risk discriminative power within normal ranges.
Background

• The main focus in recent few years has been on global longitudinal strain (GLS) which reflects the function of sub-endocardial longitudinal myofibers that are very sensitive to ischemic damage.

• We think that it’s essential to look for novel measures for LV systolic function (other than LVEF) which could define high risk patients among a group that has always been mistakenly thought to be at low risk.

• Thus, we thought that it may be of considerable interest to explore the predictive value of early GLS on 30-day outcome among apparently low-risk patients with successful reperfusion and preserved LVEF following STEMI.

Sample size calculation

Epi-info software (v 7.2.2)
Precision level 0.08
Confidence interval 95%
Methods

Single center prospective observational

110 patients

Jan to July, 2017

Methods .. inclusion criteria

All comor STEMI patients
+
Successful reperfusion (SK & PPCI)
+
Good LVEF (> 50%) at discharge
Methods .. inclusion criteria

Baseline assessment \rightarrow 30-day assessment

Methods .. Primary endpoint

Composite endpoint at 30-day
Methods .. exclusion criteria

- LVEF < 50%
- Informed Consent

Results .. study flow chart

- 165 with successful reperfusion screened
- 149 remaining
- 140 remaining
- 110 patients left for final analysis
- 16 excluded
  - AF (n=8)
  - Pace rhythm (n=3)
  - More than mild AS (n=5)
- 9 excluded due to poor image quality
- 30 excluded due to LVEF < 50%
Results .. Baseline criteria

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>(%)</th>
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<tbody>
<tr>
<td>Age (years), mean ±SD</td>
<td>58.8 ±14</td>
<td></td>
</tr>
<tr>
<td>Male gender, n (%)</td>
<td>64  (58.2)</td>
<td></td>
</tr>
<tr>
<td>DM</td>
<td>30  (27.3)</td>
<td></td>
</tr>
<tr>
<td>HTN</td>
<td>36  (32.7)</td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>43  (39.1)</td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td>25  (22.7)</td>
<td></td>
</tr>
<tr>
<td>Known dyslipidemia</td>
<td>22  (20.0)</td>
<td></td>
</tr>
<tr>
<td>FH of premature CAD</td>
<td>17  (15.5)</td>
<td></td>
</tr>
<tr>
<td>PH of CAD</td>
<td>19  (17.3)</td>
<td></td>
</tr>
<tr>
<td>PH of coronary interventions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCI</td>
<td>11  (10.0)</td>
<td></td>
</tr>
<tr>
<td>CABG</td>
<td>10  (10.0)</td>
<td></td>
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DM= Diabetes Mellitus, HTN= Hypertension, FH= Family history, CAD= Coronary artery disease, PH= Past history, STEMI= St-elevation myocardial infarction, PCI= Percutaneous coronary interventions, CABG= Coronary artery bypass graft

Results .. Reperfusion strategies

79.1% reperfused by SK
20.1% reperfused by PPCI

No significant difference in
- Total ischemic time
- Symptom onset to ST resolution time
Results.. Echocardiographic parameters

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>±SD</th>
<th>P value</th>
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<tbody>
<tr>
<td>ESV (ml) Baseline</td>
<td>46.1</td>
<td>14.0</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>30 days</td>
<td>51.8</td>
<td>15.5</td>
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<tr>
<td>EDV (ml) Baseline</td>
<td>103.6</td>
<td>23.2</td>
<td>0.003</td>
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<tr>
<td></td>
<td>30 days</td>
<td>113.1</td>
<td>28.1</td>
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<tr>
<td>EF (%) Baseline</td>
<td>55.7</td>
<td>7.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>30 days</td>
<td>48.1</td>
<td>13.5</td>
</tr>
<tr>
<td>GLS (%) Baseline</td>
<td>-15.5</td>
<td>3.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>30 days</td>
<td>-12.0</td>
<td>3.8</td>
</tr>
<tr>
<td>WMSI Baseline</td>
<td>1.3</td>
<td>0.4</td>
<td>0.694</td>
</tr>
<tr>
<td></td>
<td>30 day</td>
<td>1.2</td>
<td>0.3</td>
</tr>
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ESV= End-systolic volume, EDV= End-diastolic volume, EF= Ejection fraction, GLS= Global longitudinal strain, WMSI= Wall motion score index

Results.. In-hospital outcome

13 patients (11.8%)

4 heart failures
1 ischemic stroke
1 MI
5 resuscitated cardiac arrest

No significant difference between reperfusion strategies (SK VS. PPCI)
Results .. 30-day outcome

24 patients (21.8%)

5 CV mortality

12 urgent revascularization

No significant difference between reperfusion strategies (SK VS. PPCI)

Results .. Predictors of 30-d outcome

Baseline GLS is the best predictor

- 12.65%

Sensitivity 77.8%
Specificity 83.7%
Results .. Predictors of 30-d outcome

<table>
<thead>
<tr>
<th></th>
<th>GLS&gt; -12.65</th>
<th>GLS&lt; -12.65</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>N=33</td>
<td>N=77</td>
</tr>
<tr>
<td>Cardiovascular mortality</td>
<td>4 (12.1)</td>
<td>1 (1.3)</td>
</tr>
<tr>
<td>Re-hospitalization for heart failure</td>
<td>10 (30.3)</td>
<td>3 (3.9)</td>
</tr>
<tr>
<td>Urgent revascularization</td>
<td>5 (15.2)</td>
<td>1 (1.3)</td>
</tr>
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Results .. Case presentation

- Case # 17
- Male, 55 years old
- Anterior STEMI received PPCI
- Baseline LVEF by Simpson is 56%
- Baseline GLS – 13.8%
- No reported MACEs at 30-days Fup

A. Apical-4 chamber (AP4) longitudinal strain  
B. Apical-2 chamber (AP2) longitudinal strain  
C. Apical-3 chamber longitudinal strain  
D. Bull’s eye polar map of GLS.
Semiautomated calculation of GLS significantly predicts 30-day adverse outcome in patients with preserved LVEF following STEMI above and beyond traditional identifiers of high risk.

We recommend close monitoring to those patients by scheduling frequent follow-up visits and attention to proper prescription of guideline directed medical and interventional therapies.