LV Functional Recovery after CTO PCI.
Serial CMR substudy of the Explore trial.
CTO PCI after STEMI

On behalf of the EXPLORE Trial investigators

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Academic Medical Center
University of Amsterdam
The Netherlands
Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

<table>
<thead>
<tr>
<th>Affiliation/Financial Relationship</th>
<th>Company</th>
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<tbody>
<tr>
<td>• Grant/Research Support</td>
<td>• Abbott Vascular</td>
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<td>• Abiomed Inc</td>
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<td>• Biotronik</td>
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<td>• BBraun</td>
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Background

- CTO in non-IRA in 10% of STEMI patients

- Excess mortality in MVD patients mainly driven by presence of CTO

- Reduced LV function in MVD patients mainly driven by presence of CTO

Van der Schaaf et al, *Heart*, 2006
Claessen et al. *JACC: Cardiovascular Interventions*, 2009
EXPLORE Trial design

**Patients**

300 Patients with STEMI treated with pPCI and with a non-infarct related CTO.

**Design**

Global, multi-center, randomized, prospective two-arm trial with either PCI of the CTO or no CTO intervention after STEMI. Blinded evaluation of endpoints

**Objective**

To determine whether PCI of the CTO within seven days after STEMI results in a higher LVEF and a lower LVEDV assessed by CMR at 4 months
EXPLORE Trial Outcome

- Early CTO-PCI:
  - not associated with higher LVEF and lower LVEDV @ 4 months

CTO-PCI in the LAD was associated with higher LVEF @ 4 months
47.2±12.3% vs. 40.4±11.9%, p=0.02
EXPLORE serial CMR substudy - Objectives

GLOBAL LVF

• In-depth analysis of global functional recovery
• In-patient analysis serial CMR analysis allows to correct for possible baseline differences
• Impact of CTO Location

REGIONAL LVF

• On regional level lower %dysfunctional segments/patient after CTO PCI vs. no-CTO PCI at 4 months FU
  • (58 ±27% versus 62 ±27%, p= 0.30)
• However, no quantitative analysis in single segments performed
Serial CMR data

- CMR core laboratory
- CMR allows analysis of regional segmental outcome (segmental wall thickening (SWT))
- Dysfunctional segm = SWT < 45%
- Serial: Baseline to 4 month FU

302 patients with STEMI + CTO

1:1

- CTO PCI (n=148)
  - Functional serial CMR data (n=80)
  - Regionall serial CMR data (n=74)
- No-CTO PCI (n=154)
  - Functional serial CMR data (n=100)
  - Regional serial CMR data (n=87)
## Functional recovery

<table>
<thead>
<tr>
<th>Variable</th>
<th>CTO-PCI (n=80)</th>
<th>No CTO-PCI (n=100)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVEF@Baseline</td>
<td>40.6 (11.8)</td>
<td>41.7 (12.1)</td>
<td>0.55</td>
</tr>
<tr>
<td>LVEF @ FUP</td>
<td>45.3 (11.6)</td>
<td>45.5 (11.8)</td>
<td>0.87</td>
</tr>
<tr>
<td>Δ LVEF</td>
<td>4.6 (8.3)</td>
<td>3.8 (8.1)</td>
<td>0.52</td>
</tr>
<tr>
<td>LVEDV@Baseline (ml)</td>
<td>210.1 (53.4)</td>
<td>209.5 (55.1)</td>
<td>0.95</td>
</tr>
<tr>
<td>LVEDV @ FUP</td>
<td>215.6 (54.6)</td>
<td>212.5 (53.9)</td>
<td>0.71</td>
</tr>
<tr>
<td>Δ LVEDV</td>
<td>5.5 (32.4)</td>
<td>3.0 (25.7)</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Serial global functional CMR data available in 180 pts
Patients with and without serial CMR were comparable
# Impact of CTO location

<table>
<thead>
<tr>
<th></th>
<th>CTO LAD</th>
<th></th>
<th></th>
<th>CTO non-LAD</th>
<th></th>
<th></th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CTO-PCI (n=36)</td>
<td>No CTO-PCI (n=39)</td>
<td>P-value</td>
<td>CTO-PCI (n=112)</td>
<td>No CTO-PCI (n=115)</td>
<td>P-value</td>
<td></td>
</tr>
<tr>
<td>Age (years, mean, SD)</td>
<td>64(9)</td>
<td>60(12)</td>
<td>0.13</td>
<td>58(10)</td>
<td>60(10)</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>Male gender (%)</td>
<td>83</td>
<td>74</td>
<td>0.41</td>
<td>90</td>
<td>84</td>
<td>0.23</td>
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</tr>
<tr>
<td>Infarct related artery</td>
<td></td>
<td></td>
<td>1.0</td>
<td></td>
<td></td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>RCA (%)</td>
<td>75</td>
<td>74</td>
<td></td>
<td>17</td>
<td>16</td>
<td></td>
<td></td>
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<tr>
<td>CX (%)</td>
<td>22</td>
<td>23</td>
<td></td>
<td>20</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAD (%)</td>
<td>3</td>
<td>3</td>
<td></td>
<td>63</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-VD (%)</td>
<td>47</td>
<td>36</td>
<td>0.36</td>
<td>40</td>
<td>46</td>
<td>0.42</td>
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</tr>
<tr>
<td>MI SYNTAX score II</td>
<td>30(7)</td>
<td>30(11)</td>
<td>0.38</td>
<td>25(9)</td>
<td>26(9)</td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td>LVEF at baseline (mean, SD)*</td>
<td>44(11)</td>
<td>38(14)</td>
<td>0.07</td>
<td>39(11)</td>
<td>43(12)</td>
<td>0.05</td>
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### Global LV recovery

<table>
<thead>
<tr>
<th>Variable</th>
<th>CTO LAD</th>
<th>CTO non-LAD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CTO-PCI (n=25)</td>
<td>No CTO-PCI (n=22)</td>
</tr>
<tr>
<td>LVEF (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>44.5 (11.6)</td>
<td>36.7 (13.5)</td>
</tr>
<tr>
<td>4 months FU</td>
<td>48.4 (10.5)</td>
<td>40.6 (12.6)</td>
</tr>
<tr>
<td>Δ LVEF</td>
<td>3.9 (9.2)</td>
<td>3.8 (7.3)</td>
</tr>
<tr>
<td>LVEDV (ml)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>197.1 (57.4)</td>
<td>231.1 (64.8)</td>
</tr>
<tr>
<td>4 months FU</td>
<td>203.4 (64.0)</td>
<td>227.1 (70.7)</td>
</tr>
<tr>
<td>Δ LVEDV</td>
<td>6.3 (23.6)</td>
<td>-4.0 (29.6)</td>
</tr>
</tbody>
</table>

Success rate CTO-PCI: 80.6% versus 71.2% (p=0.27)
Regional segmental recovery

Change in % SWT (baseline to 4 months)

All segments (s = 2576)

Dysfunctional segments SWT<45% (s=1511)

Between arms p=0.28

Between arms p=0.06
Recovery in CTO territory

- Change in %SWT (baseline to 4 months) in CTO territory

All segments (s= 845)

Between arms p=0.09

<table>
<thead>
<tr>
<th>%Segmental Wall thickening</th>
<th>CTO PCI</th>
<th>No-CTO PCI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>30</td>
</tr>
</tbody>
</table>

Dysfunctional segments (s=501)

Between arms p=0.03

<table>
<thead>
<tr>
<th>%Segmental Wall thickening</th>
<th>CTO PCI</th>
<th>No-CTO PCI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>30</td>
</tr>
</tbody>
</table>
Impact of location – CTO LAD

all segments (s=640)

Between arms p=0.04

% Segmental Wall thickening

CTO PCI  52  56
No-CTO PCI  37  39

dysfunctional segments (s=374)

Between arms p=0.03

% Segmental Wall thickening

CTO PCI  25  43
No-CTO PCI  21  29
Impact of location – CTO nonLAD

all segments (s=1936)  
Between arms p=NS

%Segmental Wall thickening

CTO PCI: 37, 45  
No-CTO PCI: 44, 48

Dysfunctional segments (s=1210)  
Between arms p=NS

%Segmental Wall thickening

CTO PCI: 21, 35  
No-CTO PCI: 23, 36
Impact of success in CTO LAD vs CTO non-LAD

- **LAD**: all segments (s=352) and dysfunctional segments (s=173)

Between arms $P<0.001$
Limitations

- Small sample size
- Relatively low number of analyzable segments
- Baseline LVEF was different in the different subgroups
- Baseline CMR was not performed in all patients

However, largest paired CMR dataset in the CTO field
Conclusion

• Serial CMR confirm primary endpoints of Explore trial on global LV
• However, baseline characteristics in the subgroups differed significantly
• CTO PCI compared with no-CTO PCI associated with a greater recovery of regional segmental outcome, especially in the CTO territory
• The positive effect of CTO PCI on regional segmental outcome did not lead to a significant effect on global functional outcome

• No data on the effect of recovery of regional myocardial function and its impact on myocardial electrical stability and the translation to clinical outcome
• Further research is needed to understand the effect of CTO PCI on regional segmental recovery and its clinical impact

Submitted
STILL A LOT TO EXPLORE

www.explorettrial.com