Joint Session EHRA/LARS/SOBRAC

Substrate Image-Guided Ablation

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Heterogeneous Tissue Channels
Pixel Signal Intensity Maps

SCAR
ECG
Fractionation
Low voltage

Correlation
Delayed Enhancement

DE-CMR

MRI-PSI
25%
Infarct Core
Normal myocardium
Border Zone

EAM

BZ Channel Mass in a 3D Volume

BZ and core relationship

A: PSI Map and surface CC. B: Centerline. C: BZ Channel Mass and D: BZ and Core Relationship
MRI and VT Substrate Ablation
  - MRI-Aided
  - MRI-Guided
CMR-Aided Scar Dechanneling
Influence on Acute and Long-Term Outcomes

Ablation Protocol – Ablation Guided by the EAM – N=159

Scarc Dechanneling – Sinus Rhythm

MRI segmentation and CC detection (ADAS)
CT and MRI integration

Layer 20%

Layer 70%

Aortic root

Left Atrium

MRI Layer 20%

RCA

CC

Right Atrium

Left Atrium

LCD

MRI Layer 70%

RV
Imaging and EAM integration
CMR-Aided Scar Dechanneling

Integration of LGE-CMR information into the Nav System

PSI Map
EA Map
Hybrid Map

CMR-Aided Scar Dechanneling
Influence on Acute and Long-Term Outcomes

Pt with Ischemic Cardiomyopathy
Pt with Nonischemic Cardiomyopathy


www.adas3d.com
CMR-Aided Scar Dechanneling
Influence on Acute and Long-Term Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Total (159)</th>
<th>CMR-Aided (54)</th>
<th>Non-CMR Aided (105)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual VT after SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>70 (44%)</td>
<td>17 (32%)</td>
<td>53 (51%)</td>
<td>0.022*</td>
</tr>
<tr>
<td>Procedural succes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>130 (82%)</td>
<td>47 (87%)</td>
<td>83 (79%)</td>
<td>0.3</td>
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<tr>
<td>Partial</td>
<td>21 (13%)</td>
<td>4 (7%)</td>
<td>17 (16%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>8 (5%)</td>
<td>3 (6%)</td>
<td>5 (5%)</td>
<td></td>
</tr>
<tr>
<td>Procedure time (min)</td>
<td>229 ± 66</td>
<td>229 ± 70</td>
<td>230 ± 63</td>
<td>0.919</td>
</tr>
<tr>
<td>RF time (min)</td>
<td>24 ± 15</td>
<td>19 ± 12</td>
<td>27 ± 16</td>
<td>0.006*</td>
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<tr>
<td>RF applications</td>
<td>33 ± 18</td>
<td>28 ± 18</td>
<td>36 ± 18</td>
<td>0.37*</td>
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Kaplan-Meier curves for the endpoint of VT recurrence
CMR-Aided Scar Dechanneling
Influence on Acute and Long-Term Outcomes

Kaplan-Meier curves for the endpoint of VT recurrence

**Ischemic Cardiomyopathy Patients**
Recurrences: 18.9% vs 42.8% Log-Rank=0.05

**Nonischemic Cardiomyopathy Patients**
Recurrences: 17% vs 47%, Log-Rank=0.18

CMR-Aided Scar Dechanneling
Influence on Acute and Long-Term Outcomes

False Positives: HTCs present in the PSI maps but not in the EAM

Higher Rate of Recurrences: 29 vs 14%, Log-Rank=0.027

MRI and VT Substrate Ablation
  - MRI-Aided
  - MRI-Guided
Image-Guided VT Substrate Ablation
No Need for an Electroanatomical Map

No CMR approach

CMR-aided approach

CMR-guided approach

RV or Aortic root reconstruction for image integration

High density EAM bipolar mapping

Substrate ablation guided by electrograms characteristics

Remap and residual substrate ablation

Conventional ablation of residual VT if needed

**Image-Guided VT Substrate Ablation**

No Need for an Electroanatomical Map

- **Prospective experimental pilot study**
  - CMR-Guided: 26 consecutive pts
  - 2 control groups (CMR-Aided and No-CMR):
    - matched by LVEF, cardiomyopathy type, and need for EPI approach

<table>
<thead>
<tr>
<th></th>
<th>Guided-CMR (N=26)</th>
<th>Aided-CMR* (N=26)</th>
<th>No-CMR** (N=26)</th>
<th>P-value*</th>
<th>P-value**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>63±14</td>
<td>66±11</td>
<td>69±9</td>
<td>0,07</td>
<td>0,29</td>
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<tr>
<td>IHD (%)</td>
<td>21 (81)</td>
<td>20 (77)</td>
<td>22 (85)</td>
<td>0,37</td>
<td>0,45</td>
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<tr>
<td>• Endo(%)</td>
<td>18 (69%)</td>
<td>17 (65%)</td>
<td>17 (65%)</td>
<td>0,95</td>
<td>0,95</td>
</tr>
<tr>
<td>• Endo/Epi (%)</td>
<td>8 (31%)</td>
<td>9 (35%)</td>
<td>9 (35%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Incessant VT (%)</td>
<td>1 (4)</td>
<td>2 (8)</td>
<td>2 (8)</td>
<td>0,58</td>
<td>0,55</td>
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<tr>
<td>• Arrhythmic storm (%)</td>
<td>6 (23)</td>
<td>2 (8)</td>
<td>5 (19)</td>
<td>0,11</td>
<td>0,73</td>
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Image-Guided VT Substrate Ablation
No Need for an Electroanatomical Map

A) Image segmentation

LGE-CMR (HTC & PSI)

Fusion MDCT and LGE-CMR

MDCT

B) EP procedure

FAM of Aortic root

Integration result

QRS-Axis Based VT-Related Channel
10/26 Pts

Andreu D, et al. Heart Rhythm 2018
Target Ablation Site – All BZ Channel Entrances

No Need for an Electroanatomical Map

Electrogram at the Target Ablation Site
- No more than 3mV
- Delayed component during SR
- Hidden Slow Conduction
Image-Guided VT Substrate Ablation
No Need for an Electroanatomical Map

Procedure time (min)
Fluoroscopy time (min)
RFA time (min)

Inducibility after SD (%)
Procedure Success (%)

Soto-Iglesias, D, et al. Manuscript in Preparation 2018
Case 2

Use of MRI for clinical VT ablation
Complex Scar + LV Thrombus
MRI and CC segmentation
MRI and CT integration

Aortic root

LA

CCs

Apical thrombus
CC responsible of the clinical VT
CC entrance ablation
Summary

• MRI-Aided substrate ablation
  • Better acute and long-term outcomes than without MRI

• MRI-Guided
  • Even more efficient procedure
  • Better acute outcomes
  • Probably better long-term outcomes than guided by EAM

• New directions – Imaging-based Substrate ablation
  • Selective – Robotic - Noninvasive ablation
  • Primary prevention?

Ventricular Arrhythmia Substrate Imaging Should be Incorporated into Clinical Practice