Cardiac Resynchronization: What do we expect from new technologies

Ioannis A. Paraskevaidis
I have no Conflict of Interest
<table>
<thead>
<tr>
<th>Trial (QRS group)</th>
<th>Primary Outcome</th>
<th>HR for Primary Outcome (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPANION (&lt; 148 ms)</td>
<td>Death or Hospitalization</td>
<td>0.93 (0.69, 1.24)</td>
</tr>
<tr>
<td>COMPANION (148 to 168 ms)</td>
<td>Death or Hospitalization</td>
<td>0.78 (0.58, 1.03)</td>
</tr>
<tr>
<td>COMPANION (&gt; 168 ms)</td>
<td>Death or Hospitalization</td>
<td>0.66 (0.47, 0.92)</td>
</tr>
<tr>
<td>CARE HF (&lt; 160 ms)</td>
<td>Death or CV Hospitalization</td>
<td>0.74 (0.54, 1.02)</td>
</tr>
<tr>
<td>CARE HF (&gt; 160 ms)</td>
<td>Death or CV Hospitalization</td>
<td>0.60 (0.46, 0.79)</td>
</tr>
<tr>
<td>REVERSE (&lt; 152 ms)</td>
<td>HF Clinical Composite Score Worse</td>
<td>1.05 (0.58, 1.89)</td>
</tr>
<tr>
<td>REVERSE (&gt; 152 ms)</td>
<td>HF Clinical Composite Score Worse</td>
<td>0.42 (0.22, 0.81)</td>
</tr>
<tr>
<td>MADIT-CRT (&lt; 150 ms)</td>
<td>Death or HF Events</td>
<td>1.04 (0.73, 1.46)</td>
</tr>
<tr>
<td>MADIT-CRT (&gt; 150 ms)</td>
<td>Death or HF Events</td>
<td>0.50 (0.32, 0.73)</td>
</tr>
<tr>
<td>RAFT (&lt; 150ms)</td>
<td>Death or HF Hospitalization</td>
<td>0.99 (0.77, 1.27)</td>
</tr>
<tr>
<td>RAFT (&gt; 150ms)</td>
<td>Death or HF Hospitalization</td>
<td>0.59 (0.48, 0.73)</td>
</tr>
</tbody>
</table>

Cardiac-Resynchronization Therapy in Advanced Chronic HF


Echocardiographic measures of dysynchrony aimed at improving patient selection criteria for CRT DO NOT appear to have a clinically relevant impact on improving response rates when studied in a multicenter setting such as PROSPECT Circ. 2008;117: 2608-2616.
LV Remodeling and Regional Dyssynchrony on Long-Term Prognosis after CRT Therapy

Additive Prognostic Value of Echo GL and GC Strain to ECG Criteria in Patients With HF

![Images of echocardiograms and graphs showing GLS and ECG Criteria and GCS and ECG Criteria with Kaplan-Meier survival curves.]

- **A** GLS and ECG Criteria:
  - Log Rank p < 0.001
  - *p = 0.001 vs LBBB ≥150ms; HR 2.76 (1.68-4.54)
  - †p = 0.014 vs Inter GLS≤-9%; HR 2.02 (1.20-3.40)
  - ‡p = 0.326 vs LBBB ≥150ms

- **B** GCS and ECG Criteria:
  - Log Rank p < 0.001
  - *p = 0.001 vs LBBB ≥150ms; HR 2.82 (1.77-4.50)
  - †p = 0.002 vs Inter GCS≤-9%; HR 2.92 (1.70-5.02)
  - ‡p = 0.904 vs LBBB ≥150ms

Other Echo indices of Dyssynchrony


Hasselberg NE et al. 2016 Mar;17(3):343-50
Automatic Tools to Identify Responders to CRT

Start Systolic Index

Peak Longitudinal Displacement

Apical Rocking

3D Propagation Imaging of LV Activation by Speckle-Tracking

Before CRT

After CRT

Fusion Imaging
3D with Fluoroscopy

Lead Position Related to Regional Scar by Speckle-Tracking

Response to cardiac CRT


J. Gorcsan III et al Heart Failure Clin 13 (2017) 53–62
Responder
LVEF=23%
SSI=29%

Non Responder
LVEF=27%
SSI=5%

Non Responder
LVEF=25%
SSI=4%

SYSTOLIC STRETCH INDEX (SSI):
SPS\textsubscript{POST} + SRS\textsubscript{SEPT} = 32%

J. Lumens et al. Circ Cardiovasc Imaging. 2015;8:e003744
Electromechanical A(Dy)ssynchrony

QRS Duration & Electromechanical Dyssynchrony

D.G. Strauss et al. Am J Cardiol 2011;107:927–934
LBBB Contraction and Echo


LBBB by echo and ECG
Echo indices of A(dy)synchrony

- Early shortening of the septal wall first 70% of the ejection phase
- Early stretching of the lateral wall
- Lateral wall peak shortening after AV closure
- Early shortening of the lateral wall
- Early stretching of the lateral wall
- Early shortening of the septal wall first 70% of the ejection phase
Concordant ECG, and echo.
QRS duration = 181 ms and notching indicating a complete LBBB. Early peak contraction in the septal wall with early prestretch and late peak contraction in the lateral wall.

Disconcordance ECG, and echo. QRS duration = 151 ms no clear mid-QRS notching is present. Synchronous contraction.
Discordance echo and ECG. QRS duration = 168 ms and mid-QRS notching in leads V5 and V6. Prestretch and late peak contraction in the lateral wall, but not early septal contraction (<70% of ejection phase."

Discordance echo and ECG. QRS duration of 162 ms. The presence of mid-QRS slurring in leads V6, I, and aVR is uncertain. Opposing wall motion of early peak contraction in the septal wall with early prestretch and late peak contraction in the lateral wall.
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1) mechanical Asynchronous is actually present; ECHO
2) conduction is sufficiently delayed; ECG
3) the area of late activation can be identified; ECHO
4) comorbid conditions are considered;
5) myocardial scarring, possibly altering conduction pattern, is recognized; ECHO
6) sex-specific responses may be operative; and
7) placement of the pacing lead ideally targets the area of late activation ECHO
ΔΙΗΜΕΡΙΔΑ ΚΑΡΔΙΟ-ΟΓΚΟΛΟΓΙΑΣ / ΚΑΡΔΙΑΚΗΣ ΑΝΕΠΑΡΚΕΙΑΣ

12-13 ΜΑΪΟΥ 2017
ΑΘΗΝΑ, ΑΙΓΛΗ ΖΑΠΕΙΟΥ

ΥΠΟ ΤΗΝ ΑΙΓΙΔΑ
της ΙΑΤΡΙΚΗΣ ΣΧΟΛΗΣ ΠΑΝΕΠΙΣΤΗΜΙΟΥ ΑΘΗΝΩΝ &
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