The Role of Baseline and Follow-Up Ejection Fraction in Predicting Adverse Events Among Primary Prevention ICD Patients

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Background

• Ejection fraction (EF) is used to make decisions about implantable cardioverter defibrillator (ICD) implantation for primary prevention of sudden cardiac death.

• Understanding clinical utility of long-term follow-up EF reassessment in predicting risk for adverse clinical outcomes including ICD therapy has important implications for patient care.

Aims

• To determine the association between baseline and long-term follow-up EF and risk of long-term (1) cardiac transplant, left ventricular assist device (LVAD) implant, or death and (2) appropriate ICD therapy.

• To determine the association between early ICD therapy and risk of long-term (1) cardiac transplant, left ventricular assist device implant, or death and (2) appropriate ICD therapy.

Methods

• We performed a retrospective landmark analysis of heart failure patients who underwent primary prevention ICD implantation (EF≤35%) at Duke University from 2006 – 2015.

• Patients were required to have a baseline EF within ≤6 months of the ICD procedure and a follow-up EF 1 – 3 years after ICD implantation.

• A 3-year landmark view was employed; the EF closest to the 3-year mark was carried forward and considered the “follow-up” EF for all analyses.

• Follow-up EF was examined using 2 categorical variables: (1) ≤10% absolute improvement compared to baseline and (2) absolute value of ≥40%.

• Patients with a cardiac transplant or left ventricular assist device (LVAD) implantation during the landmark period were excluded.

• The co-primary endpoints were (1) LVAD, cardiac transplant, or death, and (2) incident appropriate ICD therapy.

• Event rates were calculated using the Kaplan Meier method. Cox Proportional Hazard models were employed to generate unadjusted and adjusted results.

Results

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean (SD in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>59.6 (13.0)</td>
</tr>
<tr>
<td>Female, %</td>
<td>27.6 (54)</td>
</tr>
<tr>
<td>Baseline EF, %</td>
<td>26.0 (6.9)</td>
</tr>
<tr>
<td>Single Chamber ICD, %</td>
<td>15.8 (31)</td>
</tr>
<tr>
<td>Ischemic Heart Disease, %</td>
<td>53.1 (104)</td>
</tr>
<tr>
<td>Hypertension, %</td>
<td>68.4 (136)</td>
</tr>
<tr>
<td>Atrial Fibrillation, %</td>
<td>27.6 (54)</td>
</tr>
<tr>
<td>NYHA Class (VI), %</td>
<td>78.6 (154)</td>
</tr>
<tr>
<td>Prior PCI, %</td>
<td>26.0 (51)</td>
</tr>
<tr>
<td>Prior CABG, %</td>
<td>24.5 (48)</td>
</tr>
<tr>
<td>Chronic Lung Disease, %</td>
<td>37.3 (54)</td>
</tr>
<tr>
<td>Cerebrovascular Disease, %</td>
<td>11.2 (22)</td>
</tr>
<tr>
<td>GFR&gt;60 mL/min/1.73 m²</td>
<td>30.1 (59)</td>
</tr>
<tr>
<td>Dialysis, %</td>
<td>3.6 [7]</td>
</tr>
<tr>
<td>ACE or ARB, %</td>
<td>54.9 (186)</td>
</tr>
<tr>
<td>Beta-blocker, %</td>
<td>77.0 (151)</td>
</tr>
<tr>
<td>Diuretic, %</td>
<td>62.8 (133)</td>
</tr>
</tbody>
</table>

Follow-up EF and Cardiac Transplant, LVAD, or Death

Follow-up EF model: Improved (≥10%) vs. stable or worsened

Baseline EF 26.0±6.9, N=196

Follow-up EF 30.1±10.2, N=196

≥10% EF increase: 25.5% (n=50)

≥40% EF increase: 22.4% (n=44)

Time Period Medium Time

ICD implant to follow-up EF assessment (days) 818
Follow-up for cardiac transplant, LVAD, or death 1078
Follow-up for ICD therapy (days) 977

Follow-up EF and Appropriate ICD Therapy

Follow-up EF model: Improved (≥10%) vs. stable or worsened

Baseline EF 26.0±6.9, N=196

Follow-up EF 30.1±10.2, N=196

Multivariable models relating follow-up EF and appropriate ICD therapy with 3-year landmark view

Follow-up EF model: Improved (≥10%) vs. stable or worsened 240% threshold

Adjusted HR: 0.26, CI 0.08 - 0.85

Multivariable models relating follow-up EF and cardiac transplant, LVAD, or death with 3-year landmark view

Follow-up EF model: Improved (≥10%) vs. stable or worsened 240% threshold

Adjusted HR: 0.26, CI 0.08 - 0.85

Limitations

• Retrospective, single center analysis

• Repeat EF assessment is not standardized after ICD implantation and is frequently obtained due to change in clinical status, potentially leading to bias

• ICD therapy zones were not standardized. ICDs were typically programmed with one zone with VF detection; beginning at 188bpm until publication of MADIT-RIT, when VF detection was routinely increased to 200bpm. Monitor only zones were typically programmed beginning at 150bpm.

Conclusions

• Among primary prevention ICD recipients, neither baseline nor long term follow-up EF appears to predict survival free of LVAD or cardiac transplant during follow-up.

• In contrast, both baseline and follow-up EF independently predict incident appropriate ICD therapy.

• Early ICD therapies are unreliable predictors of long-term ICD therapies.

Disclosures

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