Ruolo della ablazione della fibrillazione atriale nello scompenso cardiaco

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Disclosure:
Honoraria (lecture fees) from St. Jude Medical and Biosense Webster
1. AF and HF often coexist

2. AF management is, to date, suboptimal

3. Atrial fibrillation ablation, in selected candidates, is a valid option
Prevalence of HF in Selected AF Trials

≈ 40%
Pts with AF or HF who develop the other condition have poor prognosis

Thromboembolic Risk in AF and HF

Atrial fibrillation

↑ 5-fold the risk of stroke

Moderate-to-severe LVSD

↑ 2.5-fold the risk of stroke

Wolf PA et al, Arch Intern Med. 1987; 147: 1561-1564

## Novel Oral Anticoagulants (NOACs) in HF

### Patients with Heart Failure

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Novel OAC Events</th>
<th>Total</th>
<th>Warfarin Events</th>
<th>Total</th>
<th>Weight %</th>
<th>M–H, [Fixed, 95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARISTOTLE (2011)</td>
<td>70</td>
<td>3235</td>
<td>79</td>
<td>3216</td>
<td>23.1</td>
<td>0.88 [0.63, 1.22]</td>
</tr>
<tr>
<td>RE-LY (2009)</td>
<td>130</td>
<td>3871</td>
<td>71</td>
<td>1922</td>
<td>27.3</td>
<td>0.91 [0.67, 1.22]</td>
</tr>
<tr>
<td>ROCKET-AF (2011)</td>
<td>160</td>
<td>4438</td>
<td>172</td>
<td>4413</td>
<td>49.6</td>
<td>0.92 [0.74, 1.15]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>360</td>
<td>11544</td>
<td>9551</td>
<td>100.0</td>
<td></td>
<td>0.91 [0.78, 1.06]</td>
</tr>
</tbody>
</table>

Total events: 360, 9551
Heterogeneity: $\chi^2 = 0.06$, df = 2 ($p = 0.97$); $I^2 = 0$
Test for overall effect: $Z = 1.23$ ($p = 0.22$)

### In patients with HF → NOACS non-inferior to Warfarin

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Novel OAC Events</th>
<th>Total</th>
<th>Warfarin Events</th>
<th>Total</th>
<th>Weight %</th>
<th>M–H, [Fixed, 95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARISTOTLE (2011)</td>
<td>142</td>
<td>5885</td>
<td>186</td>
<td>5865</td>
<td>37.6</td>
<td>0.75 [0.30, 0.94]</td>
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<tr>
<td>RE-LY (2009)</td>
<td>197</td>
<td>8220</td>
<td>134</td>
<td>4100</td>
<td>36.1</td>
<td>0.73 [0.58, 0.91]</td>
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<tr>
<td>ROCKET-AF (2011)</td>
<td>109</td>
<td>2642</td>
<td>134</td>
<td>2676</td>
<td>26.4</td>
<td>0.82 [0.63, 1.06]</td>
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<tr>
<td>Total (95% CI)</td>
<td>448</td>
<td>16747</td>
<td>12641</td>
<td>100.0</td>
<td></td>
<td>0.76 [0.67, 0.87]</td>
</tr>
</tbody>
</table>

Total events: 448, 12641
Heterogeneity: $\chi^2 = 0.45$, df = 2 ($p = 0.80$); $I^2 = 0$
Test for overall effect: $Z = 3.98$ ($p = 0.0001$)

Rate control – Heart Rate Target

The NEW ENGLAND JOURNAL of MEDICINE

Lenient versus Strict Rate Control in Patients with Atrial Fibrillation

Cumulative Incidence of Primary Outcome (%)

<80 bpm

HR 0.84 (0.58-1.21)

<110 bpm

No. at Risk
Strict control 303 282 273 262 246 212 131
Lenient control 311 298 290 285 255 218 138

Months
Pharmacological approaches to treat atrial fibrillation in patients with heart failure

- Amiodarone
- Dronedarone (limited cases)
A typical clinical scenario

A 70 years old patient

Hypertension
Mild rheumatic mitral stenosis and regurgitation, normal left ventricle EF

Paroxysmal AF since 2005
Despite pharmacological prophylaxis with IC drugs he required three electrical cardioversions

Following the last cardioversion amiodarone was started however, four months later, he presented at the E.R. due to shortness of breath and fatigue
**Echo**: dilated left ventricle, EF 35%, severe MR, LA 189 ml/mq (395)

Normal **coronary angio**

At **cardiac MR**: EF 39%, subepicardial and intramiocardial late enhancement at the infero-lateral portion of the left ventricle
Interventional approaches to treat atrial fibrillation in patients with heart failure

• AV node ablation + RV pacing (1990)

• AV node ablation + CRT (2000)

• Atrial fibrillation ablation (2004)
AV node ablation + RV vs CRT pacing

Death for HF or hospitalization for HF or worsening HF

Sub-hazard ratio: 0.37 (95% CI, 0.18 – 0.73, p=0.005)

Brignole  Eur Heart J 2011
CRT + AV ablation vs. Drugs MILOS study

Gasparini et al. Eur Heart J 2008
CRT + AV ablation vs Drugs CERTIFY study
Atrial fibrillation and heart failure

- Triggered activity
- Heterogeneous conduction
- Atrial fibrosis
- Atrial stretch
- Pressure and volume overload
- Heart failure
- Fast ventricular rate
- Irregular cycles
- Loss of atrial contraction
- Mitral and tricuspid regurgitation

Loss of atrial contraction
Irregular cycles
Fast ventricular rate
Heart failure
Atrial fibrillation

Atrial stretch
Pressure and volume overload

Triggered activity
Heterogeneous conduction
Atrial fibrosis

Mitral and tricuspid regurgitation

Atrial fibrillation
Ablation vs. Amiodarone for Treatment of Atrial Fibrillation in Patients with Congestive Heart Failure and an Implanted ICD/CRTD

203 patients
Persistent AF
ICD/CRTD
NYHA II-III
LV EF ≤40%

10% of Amiodarone discontinuation due to side effect

Transcatheter atrial fibrillation ablation in patients with heart failure
### AF ablation in patients with reduced left ventricular ejection fraction

<table>
<thead>
<tr>
<th>Author, Year (Ref)</th>
<th>N. pts</th>
<th>F-U months</th>
<th>Success single (%)</th>
<th>Redo (%)</th>
<th>Success final (%)</th>
<th>LVEF (%)</th>
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</thead>
<tbody>
<tr>
<td>Chen 2004</td>
<td>94</td>
<td>14</td>
<td>52</td>
<td>22</td>
<td>73</td>
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<tr>
<td>Hsu 2004</td>
<td>58</td>
<td>12</td>
<td>28</td>
<td>50</td>
<td>78</td>
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<tr>
<td>Tondo 2006</td>
<td>40</td>
<td>14</td>
<td>55</td>
<td>33</td>
<td>87</td>
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<tr>
<td>Gentlesk 2007</td>
<td>67</td>
<td>6</td>
<td>55</td>
<td>31</td>
<td>86</td>
<td>42→56</td>
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<tr>
<td>Nademanee 2008</td>
<td>129</td>
<td>27</td>
<td>-</td>
<td>21</td>
<td>79</td>
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<tr>
<td>Lutomsky 2008</td>
<td>18</td>
<td>6</td>
<td>50</td>
<td>-</td>
<td>-</td>
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<tr>
<td>De Potter 2010</td>
<td>36</td>
<td>16</td>
<td>50</td>
<td>31</td>
<td>69</td>
<td>41→58</td>
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<tr>
<td>Cha 2011</td>
<td>111</td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>76</td>
<td>35→56</td>
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<tr>
<td>Anselmino 2013</td>
<td>196</td>
<td>46</td>
<td>45</td>
<td>30</td>
<td>62</td>
<td>40→50</td>
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<tr>
<td>Calvo 2013</td>
<td>36</td>
<td>6</td>
<td>70</td>
<td>31</td>
<td>83</td>
<td>41→48</td>
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<tr>
<td>Nedios 2014</td>
<td>69</td>
<td>28</td>
<td>40</td>
<td>46</td>
<td>65</td>
<td>33→48</td>
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<tr>
<td>Bunch 2015</td>
<td>267</td>
<td>60</td>
<td>39</td>
<td>-</td>
<td>-</td>
<td>27→42</td>
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<tr>
<td>Khan 2008</td>
<td>41</td>
<td>6</td>
<td>71</td>
<td>20</td>
<td>88</td>
<td>27→35</td>
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<tr>
<td>MacDonald 2010</td>
<td>22</td>
<td>10</td>
<td>-</td>
<td>30</td>
<td>50</td>
<td>36→41</td>
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<tr>
<td>Jones 2013</td>
<td>26</td>
<td>10</td>
<td>69</td>
<td>19</td>
<td>88</td>
<td>21→32</td>
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<tr>
<td>Hunter 2014</td>
<td>26</td>
<td>6</td>
<td>38</td>
<td>54</td>
<td>81</td>
<td>32→40</td>
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</table>
Catheter Ablation of Atrial Fibrillation in Patients With Left Ventricular Systolic Dysfunction
A Systematic Review and Meta-Analysis

26 Studies – 1838 Patients

<table>
<thead>
<tr>
<th></th>
<th>Mean value</th>
<th>Lower CI</th>
<th>Upper CI</th>
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</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>59</td>
<td>51</td>
<td>61</td>
</tr>
<tr>
<td>Paroxysmal AF, %</td>
<td>45</td>
<td>41</td>
<td>56</td>
</tr>
<tr>
<td>Persistent AF, %</td>
<td>50</td>
<td>35</td>
<td>54</td>
</tr>
<tr>
<td>Long-standing persistent, %</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Time since first AF diagnosis (M)</td>
<td>42</td>
<td>29</td>
<td>46</td>
</tr>
<tr>
<td>Time since first HF diagnosis (M)</td>
<td>27</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>Basal pro-BNP (pg/ml)</td>
<td>11,187</td>
<td>678</td>
<td>11,400</td>
</tr>
<tr>
<td>Cardiomiopathy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Ischemic, %</td>
<td>41</td>
<td>35</td>
<td>46</td>
</tr>
<tr>
<td>- Hypertensive, %</td>
<td>10</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>- Valvular heart disease, %</td>
<td>10</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>- Idiopathic, %</td>
<td>39</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td>LV ejection fraction, %</td>
<td>40</td>
<td>35</td>
<td>46</td>
</tr>
</tbody>
</table>

Anselmino M et al. Circ Arrhythm Electrophysiol 2014; 7: 1011-1018
### Mean follow-up:

23 (18-40) months

### Redo procedures:

4.2 (3.6-4.8)%

32 (25-38)%

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>(33-50)</td>
</tr>
<tr>
<td>60</td>
<td>(54-67)</td>
</tr>
</tbody>
</table>
Predictors of AF Recurrence

A. Time since first AF diagnosis and risk of AF recurrences

B. Time since first heart failure diagnosis and risk of AF recurrences

p=0.030

p=0.003

Anselmin M et al. Circ Arrhythm Electrophysiol 2014; 7: 1011-1018
Catheter Ablation of Atrial Fibrillation in Patients With Left Ventricular Systolic Dysfunction
A Systematic Review and Meta-Analysis

Impact on Left Ventricular Function

Anselmino M et al. Circ Arrhythm Electrophysiol 2014; 7: 1011-1018
AF ablation in heart failure

Impact of follow-up heart rhythm on LVEF

Nedios, Heart Rhythm 2014
Transcatheter ablation in our patient (10/2014)

Pulmonary vein isolation + roof and left isthmus lines + CFAEs (anterior wall and interatrial septum)
Echo: mildly dilated left ventricle, EF 50%, mild MR, LA 78 ml/mq (163)
AF ablation vs CRT + AV node ablation?

Radiofrequency ablation for persistent atrial fibrillation in patients with advanced heart failure and severe left ventricular systolic dysfunction: a randomised controlled trial

Michael R MacDonald, 1 Derek T Connelly, 1, 2 Nathaniel M Hawkins, 3 Tracey Steedman, 4 John Payne, 1 Morag Shaw, 4 Martin Denvir, 5 Sai Bhagra, 1 Sandy Small, 2 William Martin, 2 John J V McMurray, 6 Mark C Petrie, 1

A Randomized Trial to Assess Catheter Ablation Versus Rate Control in the Management of Persistent Atrial Fibrillation in Heart Failure

David G. Jones, MD, † Shouvik K. Halder, MBBS, † Wajid Hussain, MB, ChB, † Rakesh Sharma, PhD, † Darrel P. Francis, MD, † Shelley L. Rahman-Hailey, MD, † Theresa A. McDonagh, MD, † S. Richard Underwood, MD, † Vias Markides, MD, † Tom Wong, MD †

Catheter Ablation Versus Rate Control ...
**AF ablation vs CRT + AV node ablation**

**PABA-CHF**

- **PVI ablation**
- **AV node ablation and Biv pacing**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Pulmonary-Vein Isolation (N=41)</th>
<th>AV-Node Ablation with Biventricular Pacing (N=40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary artery disease (%)</td>
<td>73</td>
<td>68</td>
</tr>
<tr>
<td>Type of atrial fibrillation (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paroxysmal</td>
<td>49</td>
<td>54</td>
</tr>
<tr>
<td>Persistent or long-standing persistent</td>
<td>51</td>
<td>46</td>
</tr>
<tr>
<td>Duration of atrial fibrillation (yr)</td>
<td>4.0±2.4</td>
<td>3.9±2.8</td>
</tr>
<tr>
<td>Ejection fraction (%)</td>
<td>27±8</td>
<td>29±7</td>
</tr>
<tr>
<td>Left atrial internal diameter (cm)</td>
<td>4.9±0.5</td>
<td>4.7±0.6</td>
</tr>
</tbody>
</table>

Khan M et al; NEJM 2008
EF improved in 76% of patients
Improvement in EF by 8±8%

Decrease in EF by 1±4%
EF improved in only 25% of pts

PVs ISOLATION

AV-node ablation+BIV

Khan M et al; NEJM 2008
• Paroxysmal AF

• Persistent AF below 6 months

• Left atrium volume < 150 ml

Propose AF ablation at the earliest stage possible!
Atrial fibrillation and heart failure

- Paroxysmal
- Persistent #
- Permanent

Rhythm control

- Amiodarone ‡
- Catheter ablation §

Rate control

- PV isolation

Additional left atrial lesions

Rhythm control failure

Rate control failure

- AV node ablation
- CRT/ICD α

* Long-standing persistent to approach as persistent AF, except in case of severe left atrial dilation (volume > 150 ml)
In conclusion

Drug therapy is to date the first and most used approach but achieves poor results and side effects.

AF ablation presents similar outcome than in the general population and should be considered the first interventional option (at the early stage) to improve LVEF and symptoms.

AV node ablation + CRT ± D may be considered in late stage AF in selected cases.
Thanks for your attention!