Atrial Fibrillation Ablation: Patient Selection and Success Rate

Ralph Augustini, MD FACC FHRS
Atrial Fibrillation
Pacemaker / AV node Ablation
Complete AVN ablation

A

CS

Tricuspid Valve

HIS Bundle

Ablation Catheter

B

Aorta

Pulmonary Artery

Ablation Catheter

AV Node

His

R.V.

LV

Aortic Valve
AVN RF ablation
Objective Benefits: AV nodal Ablation


A  Left ventricular ejection fraction (%)

B  Left ventricular end systolic diameter (mm)
Complete AVN Ablation

Advantages:
- 100% efficacy
- 85% symptomatic improvement
- Improved EF (LV remodeling)
- Eliminates need for rate control drugs

Disadvantages:
- Pacemaker dependent

Good Candidates:
- Tachy / Brady Syndrome
- PCMK in Place – CHF with BiV device
- Medication refractory / intolerant
- Elderly
60 F with PAF treated with Rythmol

Presented with recurrent tachycardia
Atrial Flutter Circuit
Atrial Flutter Ablation
Atrial Flutter RFA

Termination of Atrial Flutter

III

V1

HRA

RF Current on.
Atrial Flutter Ablation

Approximately 15% of AF patients treated with an AARx will develop AFL

Advantages:
- 95% efficacy
- ≈ 80% arrhythmia control if AARx continued
- As primary Tx RFA more effective than AARx

Disadvantages: Invasive

Good Candidates:
- Typical AFL (IVC / TV isthmus)
- Primary or AARx related Atrial Flutter
Focal Origin of Atrial Fibrillation

- 94% of AF triggers from Pulmonary Veins
- “90 – 95% of all AF is initiated by PV ectopy”

Hassaiguerre M, NEJM, 1998
74 yo medically refractory AF, Echo – Normal
AA Rx - Verapamil, Rythmol, Betapace, Norpace
Lasso Catheter
Pulmonary Venous Anatomy
Mechanisms & Locations

Vein / Ligament Of Marshall
Lesion Sets – WACA vs CAFE
Left Atrial Linear Ablation
Curative RFA for All Forms of AFib

Modification of Atrial Substrate
45 yo F with medically refractory Highly Symptomatic PAF
45 yo F with Medically Refractory PAF
CT Scan / Carto Images – PA View
45 yo with PAF
Conversion of AF to NSR, LSPV with AF
# Summary of Clinical AF Ablation Studies Utilizing Circumferential Ablation

<table>
<thead>
<tr>
<th>Study</th>
<th>n</th>
<th>Mean F/U (mos)</th>
<th>Success (n, %)</th>
<th>Complications (n, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Overall</td>
<td>Paroxysmal AF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>n, (%)</td>
<td>n, (%)</td>
</tr>
<tr>
<td>Pappone et al(^<em>), 2001(^</em>)</td>
<td>251</td>
<td>10</td>
<td>188 / 251 (75%)</td>
<td>152 / 179 (85%)</td>
</tr>
<tr>
<td>Kanagaratnam et al(^*), 2001</td>
<td>71</td>
<td>29</td>
<td>15 / 71 (21%)</td>
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</tr>
<tr>
<td>Oral et al(^<em>), 2003(^</em>)</td>
<td>40</td>
<td>5</td>
<td>35 / 40 (88%)</td>
<td>35 / 40 (88%)</td>
</tr>
<tr>
<td>Kottkamp et al(^<em>), 2004(^</em>)</td>
<td>100</td>
<td>12</td>
<td>37 / 100 (37%)</td>
<td>34 / 80 (43%)</td>
</tr>
<tr>
<td>Khaykin et al(^<em>), 2004(^</em>)</td>
<td>142</td>
<td>11</td>
<td>132 / 142 (93%)</td>
<td>--</td>
</tr>
<tr>
<td>Vasamreddy et al(^<em>), 2005(^</em>)</td>
<td>70</td>
<td>6</td>
<td>39 / 70 (56%)</td>
<td>13 / 21 (63%)</td>
</tr>
<tr>
<td>Karch et al(^<em>), 2005(^</em>)</td>
<td>50</td>
<td>6</td>
<td>21 / 50 (42%)</td>
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</tr>
<tr>
<td>Ouyang et al(^<em>), 2005(^</em>)</td>
<td>40</td>
<td>8</td>
<td>38 / 40 (95%)</td>
<td>--</td>
</tr>
<tr>
<td>Oral et al(^<em>), 2006(^</em>)</td>
<td>77</td>
<td>12</td>
<td>57 / 77 (74%)</td>
<td>--</td>
</tr>
<tr>
<td>Pappone et al(^<em>), 2006(^</em>)</td>
<td>99</td>
<td>12</td>
<td>92 / 99 (93%)</td>
<td>92 / 99 (86%)</td>
</tr>
<tr>
<td>Nakagawa et al(^*), 2007</td>
<td>27</td>
<td>12</td>
<td>16 / 27 (59%)</td>
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</tr>
<tr>
<td>Kanj et al(^<em>), 2007(^</em>)</td>
<td>180</td>
<td>6</td>
<td>137 / 180 (76%)</td>
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</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1147</strong></td>
<td></td>
<td><strong>807 / 1147 (70%)</strong></td>
<td><strong>322 / 419 (77%)</strong></td>
</tr>
</tbody>
</table>

\(^*\) circumferential left atrial ablation; \(^*\)circumferential PV isolation techniques
Comparison of Antiarrhythmic Drug Therapy and Radiofrequency Catheter Ablation in Patients With Paroxysmal Atrial Fibrillation: A Randomized Controlled Trial

Major Adverse Events: Ablation 4.9% vs. AARx 8.8%
Repeat Ablation in 12.6% of patients

Conclusion  Among patients with paroxysmal AF who had not responded to at least 1 antiarrhythmic drug, the use of catheter ablation compared with ADT resulted in a longer time to treatment failure during the 9-month follow-up period.

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Current State of Curative Catheter-Based RFA

Who is a good candidate?

Symptomatic / Frequent AF

Limited Heart Disease
  EF > 35%
  LA < 5.5cm
  No MS / Rheumatic Disease

Younger Patients

No LA thrombus or History of CVA

Medically Refractory / Intolerant

(Ablation now second line therapy)
Current State of Curative Catheter-Based RFA

Procedural Success & Complications

- Total Patients > 600/year (70% PAF)
- Expected success @ 1yr
  - ≈ 70% after first procedure
  - ≈ 80% after second procedure
- Complications ≈ 2-3%
  - Tamponade – 0.6%
  - Pulmonary vein stenosis – 0.6%
  - TIA / CVA – 0.5%
  - Esophageal-LA fistula - 0
  - Groin Bleeding / Hematoma
A-Fib vs. EP Labs
New Technology: Stereo taxis Remote Magnetic Control
New Technology: Balloon Ablation

RSPV

LSPV
Cryoballoon RFA
LSPV Recordings During Ablation

Isolated PVP
Atrial Fibrillation
New Technology / Studies at Ohio State University

Stereo taxis – Magnetic Catheter Navigation

New Catheter Design / Energy Sources
  High Intensity Focused Ultrasound (HIFU)
  Ablation Frontiers – Circular Catheters
  Cryoablation
  Laser Ablation

Cabana trial – Drug vs. Ablation (including primary therapy)

Watchman – Left Atrial Appendage Closure

Surgical vs. Catheter Ablation
New Technology: Multi-electrode Ablation Catheters

Catheter Positioning in Antrum of Left PVs