Interventional or medical treatment of AF

Role of imaging
Presenter Disclosure Information

The presenter has received honoraria for participation in lectures and advisory boards from the following pharmaceutical and biotechnology companies:

- AstraZeneca, 
- Bard, 
- Bayer Healthcare, 
- Boehringer Ingelheim, 
- Boston Scientific, 
- Bristol-Myers Squibb, 
- ELPEN, 
- Galenica, 
- Lilly, 
- Medtronic, 
- Menarini, 
- MSD, 
- Pfizer, 
- Sanofi, 
- Servier, 
- StJude, 
- Unifarma, 
- Vianex.
Rate vs. rhythm control and adverse outcomes among European patients with atrial fibrillation

Yanish Purmah\textsuperscript{1,}\textdagger, Marco Proietti\textsuperscript{1,2,}\textdagger, Cecilé Laroche\textsuperscript{3}, Michal Mazurek\textsuperscript{1,4}, Dimitrios Tahanatzidis\textsuperscript{5}, Giuseppe Boriani\textsuperscript{6,7}, Salvatore Novo\textsuperscript{8}, and Gregory Y.H. Lip\textsuperscript{1,9,*} on behalf of the EORP-AF General Pilot Registry Investigators

Table 5 Cox regression analysis for all-cause death

<table>
<thead>
<tr>
<th></th>
<th>HR</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (per year)</td>
<td>1.04</td>
<td>1.02–1.07</td>
<td>0.0012</td>
</tr>
<tr>
<td>Rate control (vs. rhythm control)</td>
<td>2.83</td>
<td>1.14–7.05</td>
<td>0.0256</td>
</tr>
<tr>
<td>Previous TIA</td>
<td>2.14</td>
<td>1.15–3.99</td>
<td>0.0159</td>
</tr>
<tr>
<td>Chronic heart failure</td>
<td>2.76</td>
<td>1.65–4.61</td>
<td>0.0001</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>2.01</td>
<td>1.31–3.09</td>
<td>0.0015</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.02</td>
<td>1.33–3.08</td>
<td>0.0010</td>
</tr>
<tr>
<td>Physical activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None (ref.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occasional</td>
<td>0.40</td>
<td>0.23–0.67</td>
<td>0.0005</td>
</tr>
<tr>
<td>Regular</td>
<td>0.29</td>
<td>0.11–0.72</td>
<td>0.0080</td>
</tr>
<tr>
<td>Intense</td>
<td>0.65</td>
<td>0.16–2.70</td>
<td>0.5540</td>
</tr>
</tbody>
</table>

Figure 3 Kaplan–Meier curves for all-cause death according to baseline strategy.
Initiation of long term rhythm control therapy in symptomatic patients with atrial fibrillation
### Catheter ablation of AF: complications

<table>
<thead>
<tr>
<th>Complication severity</th>
<th>Complication type</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life-threatening complications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Periprocedural death</td>
<td>&lt;0.2%</td>
<td></td>
</tr>
<tr>
<td>Oesophageal injury (perforation/fistula)</td>
<td>&lt;0.5%</td>
<td></td>
</tr>
<tr>
<td>Periprocedural stroke (including TIA/air embolism)</td>
<td>&lt;1%</td>
<td></td>
</tr>
<tr>
<td>Cardiac tamponade</td>
<td>1–2%</td>
<td></td>
</tr>
<tr>
<td>Severe complications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulmonary vein stenosis</td>
<td>&lt;1%</td>
<td></td>
</tr>
<tr>
<td>Persistent phrenic nerve palsy</td>
<td>1–2%</td>
<td></td>
</tr>
<tr>
<td>Vascular complications</td>
<td>2–4%</td>
<td></td>
</tr>
<tr>
<td>Other severe complications</td>
<td>≈1%</td>
<td></td>
</tr>
<tr>
<td>Other moderate or minor complications</td>
<td>1–2%</td>
<td></td>
</tr>
<tr>
<td>Unknown significance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asymptomatic cerebral embolism (silent stroke)</td>
<td>5–20%</td>
<td></td>
</tr>
<tr>
<td>Radiation exposure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mixed treatment comparison of dronedarone, amiodarone, sotalol, flecainide, and propafenone, for the management of atrial fibrillation.

Effect of anti-arrhythmic drugs on all-cause mortality in studies involving >100 patients in either arm.

- Dronedarone: 0.85 (0.67, 1.09) P=0.165
- Amiodarone: 2.73 (1.00, 7.41) P=0.049
- Sotalol: 4.32 (1.59, 11.70) P=0.013

Incidence of proarrhythmics events.

- Dronedarone: 1.45 (1.02, 2.08) P=0.043
- Propafenone: 4.06 (1.13, 14.52) P=0.035
- Amiodarone: 5.45 (0.89, 42.93) P=0.095
- Sotalol: 6.44 (1.03, 40.24) P=0.047
- Flecainide: 6.77 (0.85, 54.02) P=0.067

Figure 9: Mixed treatment comparison analysis: effect of anti-arrhythmic drugs on incidence of proarrhythmic events, odds ratio, and 95% confidence intervals.
Catheter Ablation versus Standard conventional Treatment in patients with Left ventricular dysfunction and Atrial Fibrillation

The CASTLE-AF trial

Nassir F. Marrouche MD
on behalf the CASTLE AF Investigators
Catheter Ablation for Atrial Fibrillation with Heart Failure

Nassir F. Marrouche, M.D., Johannes Brachmann, M.D., Dietrich Andresen, M.D., Jürgen Siebels, M.D., Lucas Boersma, M.D., Luc Jordaens, M.D., Béla Merkely, M.D., Evgeny Pokushalov, M.D., Prashanthan Sanders, M.D., Jochen Proff, B.S., Heribert Schunkert, M.D., Hildegard Christ, M.D., Jürgen Vogt, M.D., and Dietmar Bänsch, M.D., for the CASTLE-AF Investigators*

ABSTRACT

BACKGROUND
Mortality and morbidity are higher among patients with atrial fibrillation and heart failure than among those with heart failure alone. Catheter ablation for atrial fibrillation has been proposed as a means of improving outcomes among patients with heart failure who are otherwise receiving appropriate treatment.
CASTLE-AF

Inclusion Criteria

- Symptomatic paroxysmal or persistent AF
- Failure or intolerance to ≥ 1 or unwillingness to take AAD
- LVEF ≤ 35%
- NYHA class ≥ II
- ICD/CRT-D with Home Monitoring capabilities already implanted due to primary or secondary prevention
Catheter Ablation for Atrial Fibrillation with Heart Failure

«Άπιστος Θωμάς»
Michelangelo Merisi da Caravaggio
(1571–1610)

AF Burden Derived from Memory of Implanted Devices

Catheter Ablation for Atrial Fibrillation with Heart Failure

A Death or Hospitalization for Worsening Heart Failure

Probability of Survival or Hospital Admission

Hazard ratio, 0.62 (95% CI, 0.43–0.87)
P = 0.007 by Cox regression
P = 0.006 by log-rank test

No. at Risk

<table>
<thead>
<tr>
<th></th>
<th>Ablation</th>
<th>Medical therapy</th>
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<tbody>
<tr>
<td>Months of Follow-up</td>
<td>179</td>
<td>184</td>
</tr>
<tr>
<td>0</td>
<td>141</td>
<td>145</td>
</tr>
<tr>
<td>12</td>
<td>114</td>
<td>111</td>
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<tr>
<td>24</td>
<td>76</td>
<td>70</td>
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<td>36</td>
<td>58</td>
<td>48</td>
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<td>48</td>
<td>22</td>
<td>12</td>
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Catheter Ablation for Atrial Fibrillation with Heart Failure

**B  Death from Any Cause**

<table>
<thead>
<tr>
<th>Months of Follow-up</th>
<th>Probability of Survival</th>
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<tbody>
<tr>
<td>0</td>
<td>1.0</td>
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<tr>
<td>12</td>
<td>0.9</td>
</tr>
<tr>
<td>24</td>
<td>0.8</td>
</tr>
<tr>
<td>36</td>
<td>0.7</td>
</tr>
<tr>
<td>48</td>
<td>0.6</td>
</tr>
<tr>
<td>60</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Hazard ratio, 0.53 (95% CI, 0.32–0.86)

P=0.01 by Cox regression

P=0.009 by log-rank test

<table>
<thead>
<tr>
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<th>Medical therapy</th>
</tr>
</thead>
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<tr>
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<tr>
<td>Medical therapy</td>
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<td>168</td>
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<tr>
<td>Ablation</td>
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<td>Medical therapy</td>
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<td>71</td>
<td>63</td>
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<tr>
<td>Medical therapy</td>
<td>27</td>
<td>19</td>
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</tbody>
</table>

Marrouche H, et al. New Eng J Med 2018;378(5);417-427
Catheter ABlation vs ANtiarrhythmic Drug Therapy in Atrial Fibrillation (CABANA) Trial

Douglas L. Packer MD, Kerry L. Lee PhD, Daniel B. Mark MD, MPH, Richard A. Robb PhD
for the CABANA Investigators

Mayo Clinic Rochester
Duke Clinical Research Institute
National Heart, Lung, and Blood Institute
Patient Randomization

Subjects 2204

Ablation Therapy 1108
- Ablated 1006 (90.8%)
- Repeat ablation 215 (19.4%)
- Not ablated 102 (9.2%)
- Completed FU 1002 (90.4%) 48.9 mo

Drug Therapy 1096
- Drug Treated 1092 (99.6%)
  - Rhythm control 953 (87.2%)
  - Rate control only 126 (11.5%)
- Cross Over Ablated 301 (27.5%)
- Completed FU 966 (88%) 48.2 mo

*C Withdrew <3 years*
Primary Endpoint (Death, Disabling Stroke, Serious Bleeding, or Cardiac Arrest) (ITT)

Ablation vs. Drug
Hazard ratio: 0.86 (95% CI, 0.65–1.15)
P=0.303

Event rate (%) vs. Months since randomization

Number at risk
Drug: 1096, 1036, 1006, 970, 880, 763, 652, 578, 499, 418, 312
Ablation: 1108, 1045, 1021, 996, 915, 793, 700, 614, 535, 432, 309
“9.2% of ablation patients did not get the procedure and 27.5% of the drug group crossed over to ablation”
The role of imaging before AF ablation

**TEE:** For all or only for persistent AF?
The role of imaging in facilitating transeptal puncture
TEE: Necessity or Luxury?
Intracardiac Echo
Necessity or Luxury?
Mild Symptoms but SBP drops to 80mmHg within minutes
LA – Esophageal fistula after Intraoperative AF Ablation

1. Esophagus
2. Air in madiastinum due to perforation of esophagus
3. Dye in the madiastinum escaping from esophagus

Courtesy of Dr Dagres and Dr Hidricks
Ablation for AF/AT in patients with complex anatomy

2 valves+intraoperative ablation  CRTD, LVEF=35%, MV  3rd ablation, CABG, post Abl AT

Fallot, AT/AF

G.Andrikopoulos, 2011
Occlusion, freezing and PV isolation

Started 11:14 ended 11:51

RIPV

Αρχείο Γ. Ανδρικόπουλου, Ερρίκος Ντυνάν, 2016
Ostium diameter is a predictor of acute pulmonary vein isolation with cryoballoon ablation

Conclusion

Projected ostium PV diameter appears to be an accurately measured marker which can help physicians to estimate the difficulties and safety of ablation using the second-generation cryoballoon in case preprocedural 3-dimensional imaging is not performed. Isolation of larger PVs is more challenging and may support the need for a cryoballoon of size larger than 28 mm.
Review Article

The Role of Magnetic Resonance Imaging and Cardiac Computed Tomography in the Assessment of Left Atrial Anatomy, Size, and Function

**Figure 7:** ECG-gated contrast-enhanced CT image depicting a thrombus in the left atrial appendage (arrow).

**Figure 8:** Contrast-enhanced CT scan showing two left-sided and two right-sided pulmonary veins.

LSPV and RIPV venographies
Association of Atrial Tissue Fibrosis Identified by Delayed Enhancement MRI and Atrial Fibrillation Catheter Ablation
The DECAAF Study

Stage 1 (<10% of the LA-wall)  Stage 2 (≥10%–<20% of the LA-wall)

Stage 3 (≥20%–<30% of the LA-wall)  Stage 4 (≥30% of the LA-wall)
69 year old patient with PAF with no structural heart disease, normotensive, reporting no other major health problems in the past (AP view)
69 year old patient with PAF with no structural heart disease, normotensive, reporting no other major health problems in the past (PA view)
Atrial fibrosis detection (2)

- Relatively weak relationship between extent & time in AF
- Narrow range that may limit clinical stratification

\[ n = 60 \text{ prior to ablation; } 58\% \text{ pAF} \]

Spearman's rho = 0.336, \( P = 0.009 \)

**Atrial fibrosis**

Is it driving atrial fibrillation? Is it a target for treatment?

Dipak Kotecha, MBChB PhD MRCP FESC FHEA
One Shot Multi-electrode Irrigated RF

Designed to improve procedural efficiency

Built-in Cameras
 Validation of electrode contact via real-time visualization

Integrated Mapping and Pacing
 Eliminates need for mapping catheter

CAUTION-Investigational device. Limited by Federal (or United States) law to investigational use.
Imricor Medical Systems, Inc.

OCTOBER 09, 2014

Imricor Medical Systems Announces First Procedures in Clinical Study of MR-Enabled™ Cardiac Ablation Products

First patients treated with Vision-MR™ Ablation Catheters

Minneapolis, Minn. – Oct. 9, 2014 – Imricor Medical Systems, Inc. announced the first three cardiac ablation procedures were completed in the first clinical study that is evaluating the feasibility of their MR-enabled™ products to treat atrial flutter. Professor Reza Razavi, Head of the Division of Imaging Sciences & Biomedical Engineering, King’s College London, is the principal investigator for the study and along with Mark O’Neill, Professor of Cardiac Electrophysiology and Consultant Cardiologist, Guy’s and St. Thomas’ NHS Trust performed the procedures. The prospective pilot study will enroll up to 15 patients at this center.
Ευχαριστώ την ομάδα ηλεκτροφυσιολογίας του Ερρίκος Ντυνάν Hospital Center

Ηλεκτροφυσιολόγοι
- Ανδρικόπουλος Γ.
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- Παστρωμάς Σ.
- Συκιώτης Α.
- Κουρκούτη Π.
- Ταμπάκης Κ.

Αναισθησιολόγοι
- Μπουσούλα Μ.
- Ροζάκης Δ.

Νοσηλευτές
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- Αλεξοπούλου Γ.
- Γουργιώτη Ζ.
- Καμμένος Σ.
- Κληματσούδας Β.
- Μαυροδήμου Ν.

Τεχνολόγοι
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- Ρουμάνη Μ.
- Στεφανάκη Ε.
- Χάιδος Γ.