Atrial Fibrillation
New Approaches, Techniques, and Technology
State of the Art – 2015

Richard Abben, M D
Director, Cardiac Arrhythmia Service
Cardiovascular Institute of the South
Associate Clinical Professor of Medicine
LSU School of Medicine
Atrial Fibrillation

2015 Advances

- Mechanisms
- Cardiac monitoring
- Medical Therapy
- Role of Ablation
- Lifestyle Management Strategies
2.7 million US patients

5-7x increased CVA rate

Anticoagulation Rx essential in most patients

Drug therapy with modest benefit

Ablation techniques with improved results

Lifestyle changes essential
• Rapidly discharging foci that originate in pulmonary veins and disrupt normal atrial rhythm

• Isolation of pulmonary veins is the goal of AF ablation
Atrial Flutter – Distinctive Mechanism
Atrial Flutter

Mechanism
- Rotating circuit in right atrium only
- Typical – Counterclockwise; Reverse typical – Clockwise
- IVC – Tricuspid annulus ("cavotricuspid isthmus") is the target of ablation

Management
- Medical Therapy similar to Atrial Fibrillation including rate control and anti-arrhythmics
- Ablation targets “Cavotricuspid isthmus” or “CTI” with very high success rate
- Atrial fibrillation may later occur as underlying substrate similar
- Anticoagulation essential in most patients similar to AF with $\text{CHA}_2\text{DS}_2\text{-VASc}$ score providing guidance
Event Risk Increased with AF

RR = Relative Risk

Anticoagulation Studies

Studies
1 – Framingham
2 – Regional Heart Study
3 – Whitehall
4 – Manitoba

CVA
Death

Stroke Prevention in AF
Anticoagulation Trials

Relative Risk Reduction (95% CL)

AFSAK 1, SPAF, BAATF, CAFA, SPINAF, EAFAN, ALL TRIALS

Dose-Adjusted Warfarin with 61% Risk Reduction of Stroke

Aspirin in all patients for primary prevention has been questioned - JPPP (Japanese Primary Prevention Project) evaluated 14,658 patients with CV risk factors - 6.5 years - No CV death/MI reduction with aspirin - Multiple studies in progress - ARRIVE, ASCEND, ASPREE

Aspirin may not be needed in stable CAD pts on warfarin - French study examined 4184 stable CAD patients (no recent stents or MIs) - Aspirin with warfarin highest bleeding, mortality risk - Aspirin with warfarin without CV benefit

**FIGURE 3** Cardiovascular Death, Myocardial Infarction, or Nonhemorrhagic Stroke in Stable Coronary Artery Disease Patients Treated With Vitamin K Antagonists According to Antiplatelet Use

Kaplan-Meier curves with hazard ratios (HRs) during follow-up. HR (95% confidence interval) for VKA + APT versus VKA alone. *Analyses were adjusted for age, sex, diabetes mellitus, previous heart failure, and estimated glomerular filtration rate. Abbreviations as in Figure 2.

Cardiac Electrophysiology

Atrial Fibrillation

2015 Advances

Cardiac Monitoring

- Syncope
- Cryptogenic CVA/AF
- Clinical benefits of remote monitoring for arrhythmia detection and survival
EMBRACE trial

- 572 patients with cryptogenic CVA
- Randomized to standard 24-hour Holter or 30-day ambulatory telemetry
- Atrial fibrillation detection
  - Holter - 3.2%
  - 30-day - 16.1%

CRYSTAL AF trial

- 440 patients with cryptogenic CVA
- Randomized to standard 24-hour Holter or implantable monitor recordings
- Atrial fibrillation detection
  - Holter
  - 30-day - 10.1%
EMBRACE trial

- 572 patients with cryptogenic CVA or TIA
- Randomized to standard 24-hour Holter or 30-day ambulatory telemetry
- Atrial fibrillation detection
  - Holter: 3.2%
  - 30-day: 16.1%

CRYSTAL AF trial

- 440 patients with cryptogenic CVA
- Randomized to standard 24-hour Holter or implantable monitor recordings
- Atrial fibrillation detection
  - Holter: 1.8%
  - Implantable: 8.9%

30% AF detection at 36 months

- Holter: 1.8%
- Implantable: 8.9%
Remote monitoring

Current devices (Pacemakers and ICDs) record arrhythmic events and this data can be accessed remotely via wireless technology.

Benefits

- **Arrhythmia detection and documentation**
- **Survival benefit!**
Remote monitoring
Current devices (Pacemakers and ICDs) record arrhythmic events and this data can be accessed remotely via wireless technology.
**ASSERT trial**

- **2580 cardiac device patients**
- **No AF history**
- **3-month monitoring to assess presence of AF/SVT - >190 bpm x >6minutes**
- **30-month follow-up**

**Results**

- **Clinical AF rate**
  - **15.7% vs 3.1%**
- **CVA rate**
  - **4.2% vs 1.7%**

*p<0.01*
ASSERT trial

- 2580 cardiac device patients
- No AF history
- 3-month monitoring to assess presence of AF/SVT >190 bpm x >6 minutes
- 30-month follow-up

Results

Clinical AF rate: 15.7% vs 3.1%
CVA rate: 4.2% vs 1.7%
p<0.01
Wireless monitoring study

- 262,000 cardiac device patients with wireless capability
- Patient outcomes evaluated in relation to usage of remote system
- High use >75%
- Low use <75%
- No use

Results -- Survival

- High use versus Low use
  53% improvement
- High use versus No use
  140% improvement

p<0.001

Persistent AF (or flutter)

Medical Management Strategies

No conversion
Rate control and anticoagulation

Attempt conversion
NSR maintenance and anticoagulation

AF trials - - AFFIRM, RACE, STAF
Tachycardia-induced Cardiomyopathy

- Anticoagulation
- Carvedilol, Lisinopril
- Lasix, Spironolactone
- Amiodarone
- Cardioversion
- Catheter ablation

Class I at 3 weeks
NSR maintained
Echo EF at 3 months – 50%
A COMPARISON OF RATE CONTROL AND RHYTHM CONTROL IN PATIENTS WITH ATRIAL FIBRILLATION

THE ATRIAL FIBRILLATION FOLLOW-UP INVESTIGATION OF RHYTHM MANAGEMENT (AFFIRM) INVESTIGATORS*

ABSTRACT

**Background** There are two approaches to the treatment of atrial fibrillation: one is cardioversion and treatment with antiarrhythmic drugs to maintain sinus rhythm, and the other is the use of rate-controlling drugs, allowing atrial fibrillation to persist. In both approaches, the use of anticoagulant drugs is recommended.

**Conclusion** ATRIAL fibrillation is the most common sustained cardiac arrhythmia, yet the optimal strategy for its management remains uncertain. During atrial fibrillation, most symptoms (but perhaps not all) are caused by a poorly controlled or irregular ventricular rate, and the associated risk of death is doubled in patients who have...
AFFIRM Trial – Rate vs Rhythm Control

Study protocol

• 4060 patients (69.2 years)
  • Rate control
    Beta, calcium blockers, digoxin
    AV nodal ablation
  • Rhythm control
    Anti-arrhythmic agents, cardioversion
  • 3.5 years f/u
Rhythm Control -- No Mortality Benefit

- Hospitalization rate higher with Rhythm control
- Trend towards higher CVA rate with Rhythm control (anticoagulation rate lower!)

<table>
<thead>
<tr>
<th>Ischemic Stroke</th>
<th>157 (6.3)</th>
<th>77 (5.5)</th>
<th>80 (7.1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(without warfarin)</td>
<td>69</td>
<td>25</td>
<td>44</td>
</tr>
</tbody>
</table>

Figure 1. Cumulative Mortality from Any Cause in the Rhythm-Control Group and the Rate-Control Group. Time zero is the day of randomization. Data have been truncated at five years.
The previous trials occurred before AF ablation become a standard approach

Anticoagulation should be continued in most patients regardless of treatment strategy used

Alternatives to warfarin (Thrombin and Xa inhibitors) readily available with excellent outcomes
## Rhythm Control with Medical Therapy
### Resistant Paroxysmal or Persistent AF

<table>
<thead>
<tr>
<th>Non-Ischemic</th>
<th>Ischemic</th>
<th>Heart Failure, CMP (Severe LVH, EF &lt; .35)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Heart Failure</td>
<td>No Heart Failure</td>
<td></td>
</tr>
</tbody>
</table>

- **Flecainide, Propafenone**
  - Sotolol, Dronedarone
  - Dofetilide
  - Amiodarone (Class IA)

- **Flecainide**, **Propafenone**
  - Sotolol, Dronedarone
  - Dofetilide
  - Amiodarone (Class IA)

- **Flecainide, Propafenone**
  - Sotolol, Dronedarone
  - Dofetilide
  - Amiodarone

Efficacy (%) of Antiarrhythmic Agents - - 6 months

- Flecainide
- Sotolol
- Dofetilide
- are reasonable options

% Sinus Rhythm

<table>
<thead>
<tr>
<th>Drug</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>No drug</td>
<td>30</td>
<td>45</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>50</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Quin</td>
<td>40</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Diso</td>
<td>30</td>
<td>45</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>50</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Prop</td>
<td>40</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Flec</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Sot</td>
<td>40</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Dof</td>
<td>30</td>
<td>45</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>50</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Amio</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

****Antiarrhythmic therapy relatively ineffective and has never been shown to improve survival in AF patients!
Catheter Ablation of Atrial Fibrillation
Technical Approaches in AF ablation

- Radiofrequency ablation
- Cryo, Ultrasonic Balloon ablation
- Convergent RF endocardial and epicardial

Epicardial and endocardial lines of block created
After Ablation -- PV AF isolated
Catheter Ablation of Atrial Fibrillation
Success versus Medical Therapy

Quality of Life Scores


Catheter Ablation of Atrial Fibrillation

Success Rates

12 months/Multi-procedure

79.8% success at 1 year

AF ablation – Overview - 2015

- Generally indicated in drug-resistant, symptomatic patients
- Best results in younger patients with paroxysmal AF and no structural heart disease
- Results have progressively improved
- Recent trial demonstrated benefit in heart failure pts versus amiodarone

- Success rates
  - Paroxysmal – 60-80%
  - Persistent – 50-70%
- 2nd procedure needed in 10 – 20% of cases
- Complication rates
  - Major < 5%
  - Death – 0.7%
Optimal approach to AF ablation

(RF, Ultrasound, Epicardial, Convergent, Surgical)

has not been confirmed.

AF is a chronic disease in many patients and risk factors, lifestyle of key importance!
AF ablation – Overview - 2015

Cardiometabolic AF Risk Factors
- Obesity/OSA
- Diabetes
- Hypertension
- Alcohol

AF is a chronic disease in many patients and risk factors, lifestyle of key importance!
Sleep Apnea
More AF before and after Ablation

142 patients with Sleep Apnea

Assessment post-AF ablation

AF ablation – Overview - 2015

ARREST AF trial

Aggressive Risk factor REducation Study for Atrial Fibrillation and Implications for the Outcomes of Ablation

281 AF ablation patients
Risk Factor Modification program vs Standard care after ablation
ARREST AF study

ARREST AF study results applicable to AF population prior to ablation too . . .

LEGACY trial

RFM group - - Improved weight, BP, DM, and lipids and AF recurrence
LEGACY trial - - - ACC meeting - - March, 2015

- Group 1 - - AF burden reduced 6x (p<0.000001)
- Group 1 and Group 2 - - LA volumes and LVH reduced
  - Gradual weight loss most effective
- Group 1 – 46% without AF without med/ablation Rx!
Atrial Fibrillation

2015 Advances

AF - - PV origin
Flutter - - Right atrial circuit

Cardiac monitoring enhances AF detection and survival

Medical Rx effective in some, recurrences possible

Ablation results improving

Lifestyle changes essential
Dofetilide (Tikosyn)

**DIAMOND-CHF Study**

1518 patients with Heart failure/LV dysfunction

Three-Day admission to Initiate Rx, monitor QT interval

- 756 Patients - - Placebo
- 762 Patients - - Dofetilide
Dofetilide
(Tikosyn)

DIAMOND-CHF Study

No Adverse Effect on Survival
Dofetilide (Tikosyn)

DIAMOND-CHF Study

Outcome
Patients with Baseline AF