Contemporary Management of Atrial Flutter & Atrial Fibrillation

Atrial Fibrillation - fibrillatory waves

Atrial Flutter - sawtooth pattern

Brett Roberts, MD
November 14th 2015
Atrial Fibrillation: Coumadin and Forgetaboutit. Right?
Disclosures

• None
Objectives

• Provide a general overview as well as management strategy for atrial flutter and atrial fibrillation (AF)
• Discuss indications for radiofrequency catheter ablation (RFA) as a potential treatment strategy for atrial flutter and atrial fibrillation
• Provide a brief overview of ablation procedure
• Discuss complications of RFA
Atrial Flutter

- Supraventricular tachycardia
  - Paroxysmal SVT
    - Atrial tachycardia
    - AVNRT
    - ORT
  - Atrial Fibrillation
  - Atrial Flutter
- First described in 1911
  - Jolly and Ritchie
Atrial Flutter

- Mechanism described in 1970s
57y old male with PMH of HTN who presents with new onset atrial flutter with a ventricular rate of 87bpm. What would you do long-term for this gentleman?

- Leave him in atrial flutter since he is rate controlled
- Cardioversion
- Antiarrhythmic drug
- Ablation
Drug Therapy vs Ablation for Atrial Flutter

- 61 patients who presented with symptomatic atrial flutter for the second time

<table>
<thead>
<tr>
<th></th>
<th>Antiarrhythmic drug therapy**</th>
<th>RF ablation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrial Flutter Recurrence</td>
<td>93%</td>
<td>6%</td>
</tr>
<tr>
<td>Rehospitalized</td>
<td>63%</td>
<td>22%</td>
</tr>
</tbody>
</table>

** AAD included sotalol, amiodarone, flecainide, procainamide, propafenone

Natale JACC 2000
## Drug Therapy Group

### Table 3. Quality of Life and Symptoms Scores in the Drug Therapy Group

<table>
<thead>
<tr>
<th></th>
<th>Pretreatment</th>
<th>Posttreatment (6 mo)</th>
<th>Posttreatment (12 mo)</th>
<th>Overall p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sense of well being</td>
<td>1.9 ± 0.4</td>
<td>2.0 ± 0.4</td>
<td>2.1 ± 0.3</td>
<td>NS</td>
</tr>
<tr>
<td>Function in daily life</td>
<td>2.1 ± 0.4</td>
<td>2.1 ± 0.3</td>
<td>2.3 ± 0.3</td>
<td>NS</td>
</tr>
<tr>
<td>Palpitation</td>
<td>3.2 ± 0.6*</td>
<td>2.0 ± 0.5</td>
<td>2.1 ± 0.7</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>SOB with exercise</td>
<td>3.4 ± 0.4</td>
<td>3.2 ± 0.4</td>
<td>3.0 ± 0.5</td>
<td>NS</td>
</tr>
<tr>
<td>Feeling weak</td>
<td>2.9 ± 0.3</td>
<td>3.0 ± 0.4</td>
<td>3.1 ± 0.4</td>
<td>NS</td>
</tr>
<tr>
<td>QOL total score</td>
<td>29 ± 3</td>
<td>28 ± 6</td>
<td>31 ± 5</td>
<td>NS</td>
</tr>
</tbody>
</table>

*p < 0.001. Pretreatment versus posttreatment 6 months and posttreatment 12 months. All other comparisons did not show statistical significance.

QOL = quality of life overall score; SOB = shortness of breath.
<table>
<thead>
<tr>
<th></th>
<th>Preablation</th>
<th>Postablation (6 mo)</th>
<th>Postablation (12 mo)</th>
<th>Overall p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sense of well being</td>
<td>2.0 ± 0.3*</td>
<td>3.9 ± 0.3</td>
<td>3.8 ± 0.5</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Function in daily life</td>
<td>2.3 ± 0.4*</td>
<td>3.8 ± 0.5</td>
<td>3.6 ± 0.6</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Palpitation</td>
<td>3.1 ± 0.6*</td>
<td>1.0 ± 0.4</td>
<td>1.0 ± 0.5</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>SOB with exercise</td>
<td>3.0 ± 0.4*</td>
<td>1.0 ± 0.5</td>
<td>1.2 ± 0.3</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Feeling weak</td>
<td>2.9 ± 0.5*</td>
<td>0.8 ± 0.4</td>
<td>0.8 ± 0.5</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>QOL total score</td>
<td>30 ± 4†</td>
<td>59 ± 7</td>
<td>57 ± 6</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

*p < 0.001. Preablation versus postablation 6 months and postablation 12 months. †p < 0.0001. Preablation versus postablation 6 months and postablation 12 months. Postablation 6 months versus postablation 12 months, p = NS.

QOL = quality of life overall score; SOB = shortness of breath.
Amio vs Ablation first line therapy

- Amiodarone had a 30% recurrence rate of AFL compared to 4% in the RFA group.

Figure 1. Kaplan-Meier estimates of the percentage of patients remaining free of recurrence of AFL in the RFA (red triangles) and amiodarone (white diamonds) groups.
Atrial Flutter Ablation

**Complications**
- 1% chance of AV block
- Rare
  - VT
  - Occlusion of RCA
  - Perforation
  - IVC narrowing

**Efficacy**
- 95% cure rate
ACC AHA guidelines

- **CLASS I recommendation for ablation**
  - Atrial flutter with **ANY** of the following
    - Recurrent
    - Poorly tolerated
    - Occurs with AADs

- **CLASS IIa recommendation for ablation**
  - First episode of well tolerated AFI
Questions?
Atrial Fibrillation

Normal Electrical Pathways

Abnormal Electrical Pathways

Normal Sinus Rhythm

Atrial Fibrillation
What is AF?
Definitions

- **Paroxysmal AF**
  - $\geq 2$ episodes which spontaneously terminate within 7 days

- **Persistent AF**
  - Sustained for $> 7$ days; or less than 7 days requiring cardioversion
  - Long-standing persistent ("chronic")- $> 1$ year

- **Permanent AF** — cardioversion failed or not attempted
Epidemiology of AF

- Affects 2.2 million Americans
- Hospitalizations increased by 34% from 1996-2001
- After age 40, lifetime risk for men is 26% and for women is 23%
Epidemiology of AF

- Mayo Clinic data (assuming continued increase in AF incidence)
- Mayo Clinic data (assuming no further increase in AF incidence)
- ATRIA study data

Miyasaka, Circ 2006
Cardiovascular Disease Burden

A new KFC opens in China every single day
Physiologic implications

- Loss of atrial mechanical function
  - Loss of AV synchrony
- Reduced coronary blood flow
- Atrial structural remodeling
  - dilatation
  - fibrosis
- LV dysfunction (tachycardia-related cardiomyopathy)
- Mitral regurgitation

Symptomatic impairment
Presentation

- Palpitations, SOB, chest discomfort, effort intolerance, lightheadedness, irritability
- Fatigue
- CHF
- TIA/CVA
- Syncope – uncommon
- Sudden death – extremely rare
- No or mild symptoms – especially in elderly
Impact of AF

Learning and Memory in AF

- Predicted mean performance in learning and memory (z-score, 95% CI)
  - No AF
  - PAF
  - CAF

P<0.01
P=0.06

Hippocampal volume

- Relative hippocampal volume in cubic centimeters

- No AF
- AF

Knecht et al EHJ 2008
AF and Dementia (N=37,025)

- Vascular
- Senile
- Alzheimer's
- Nonspecific

Odds ratio

Age

< 70  70-79  80-89  > 90

Bunch et al HR 2010
Stroke risk with AF

- **CHA\textsubscript{2}DS\textsubscript{2}-VASc scoring system**

<table>
<thead>
<tr>
<th>CHA\textsubscript{2}DS\textsubscript{2}-VASc Risk</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF/EF $\leq$ 40%</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>Age $\geq$ 75</td>
<td>2</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1</td>
</tr>
<tr>
<td>Stroke/TIA/Thromboemboli</td>
<td>2</td>
</tr>
<tr>
<td>Vasc Disease</td>
<td>1</td>
</tr>
<tr>
<td>Age 65 - 74</td>
<td>1</td>
</tr>
<tr>
<td>Female</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHA2DS2-VASc score</th>
<th>Patients ($n = 7329$)</th>
<th>Adjusted stroke rate (%/year)</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>422 (6%)</td>
<td>1.3</td>
</tr>
<tr>
<td>2</td>
<td>1230</td>
<td>2.2</td>
</tr>
<tr>
<td>3</td>
<td>1730</td>
<td>3.2</td>
</tr>
<tr>
<td>4</td>
<td>1718</td>
<td>4.0</td>
</tr>
<tr>
<td>5</td>
<td>1159</td>
<td>6.7</td>
</tr>
<tr>
<td>6</td>
<td>679</td>
<td>9.8</td>
</tr>
<tr>
<td>7</td>
<td>294</td>
<td>9.6</td>
</tr>
<tr>
<td>8</td>
<td>82</td>
<td>6.7</td>
</tr>
<tr>
<td>9</td>
<td>14</td>
<td>15.2</td>
</tr>
</tbody>
</table>
HAS-BLED Score

- Hypertension History? (uncontrolled, >160 mmHg systolic)
- Renal Disease? (Dialysis, transplant, Cr >2.6 mg/dL or >200 μmol/L)
- Liver Disease? (Cirrhosis, Bilirubin >2x Normal, AST/ALT/AP >3x Normal)
- Stroke History?
- Prior Major Bleeding or Predisposition to Bleeding?
- Labile INR? (Unstable/high INRs,
- Age ≥65?
- Medication Usage Predisposing to Bleeding? (Antiplatelet agents, NSAIDs)
- Alcohol Usage History?
- Patient has none of these

Score
Click!

<table>
<thead>
<tr>
<th>Letter</th>
<th>Clinical Characteristic*</th>
<th>Score</th>
<th>HAS-BLED Score</th>
<th>Bleeds per 100 Patient-years†</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Hypertension</td>
<td>1</td>
<td>0</td>
<td>1.13</td>
</tr>
<tr>
<td>A</td>
<td>Abnormal renal and liver function (1 point each)</td>
<td>1 or 2</td>
<td>1</td>
<td>1.02</td>
</tr>
<tr>
<td>S</td>
<td>Stroke</td>
<td>1</td>
<td>2</td>
<td>1.88</td>
</tr>
<tr>
<td>B</td>
<td>Bleeding</td>
<td>1</td>
<td>3</td>
<td>3.74</td>
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<tr>
<td>L</td>
<td>Labile INRs</td>
<td>1</td>
<td>4</td>
<td>8.70</td>
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<tr>
<td>E</td>
<td>Elderly</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Drugs or alcohol (1 point each)</td>
<td>1 or 2</td>
<td>Maximum 9 points</td>
<td></td>
</tr>
</tbody>
</table>
Management of Atrial Fibrillation
AFFIRM – Rate vs. rhythm control

Cumulative Mortality (%) vs. Years

Rhythm control vs. Rate control

P = 0.08

AFFIRM NEJM 2002
AFFIRM Trial

Management of atrial fibrillation with the rhythm-control strategy offers no survival advantage over the rate-control strategy, and there are potential advantages, such as a lower risk of adverse drug effects, with the rate-control strategy.
So what is the problem?
AFFIRM

- Should not be extrapolated to all patients with AF
  - Largely asymptomatic
  - Elderly population (average 70 years)
  - Sinus rhythm only "achieved" in 2/3
    - Rhythm status only assessed by ECG in office
    - Prevalence of sinus rhythm likely much lower if assessed by extended monitoring
Stroke vs. Strategy

Prevalence of Stroke

- AFFIRM
- RACE
- PIAF
- STAF
- HOT CAFÉ

Rate
Rhythm

Legend:
Problems with AFFIRM

![Graph showing distance progression over time with rate and rhythm data.](Chung_JACC_2005)
Antiarrhythmic therapy (SAFE-T)

Recurrence rate @ 1 yr.

- Amiodarone
- Sotalol
- Placebo

Singh et al NEJM 2005
Dronedarone vs. Placebo

Cumulative Incidence (%)

- Placebo
- Dronedarone

Hazard ratio, 0.73 (95% CI, 0.59 to 0.89)
P = 0.002

Dronedarone (Multaq)

Singh et al NEJM 2007
On-treatment analysis

- SR associated with improved survival (OR 0.53, p<0.001)
- Conclusion
  - beneficial effects of antiarrhythmic therapy neutralized by their harmful side effects
    - Antiarrhythmic drugs increased mortality by 49%
  - Method of achieving sinus rhythm without increasing mortality would be desirable

- That method is ...

Corley et al Circ 2004
RF ablation versus Anti-arr. drugs

- Wazni et al: Control 37, Ablation 87
- Stabile et al: Control 9, Ablation 56
- Oral et al*: Control 4, Ablation 74
- Pappone et al*: Control 35, Ablation 93
- Jais et al*: Control 6, Ablation 75

Percent of patients in sinus rhythm
Success of catheter ablation

71% cure rate for paroxysmal atrial fibrillation off of antiarrhythmic therapy with multiple procedures
Outcomes
Mortality Benefit

Cabana Study

- Large Randomized Study
- 3000 patients
- AAD vs Catheter ablation
- Powered for mortality
Pathophysiology of Atrial Fibrillation
Posterior Left Atrium

LAA
LSPV
LIPV
RSPV
RIPV
Microscopic Appearance of Myocardial Sleeves of Pulmonary Veins (2 hearts)

Saito et al, JCE, 8/00
Transeptal Video
NAVISTAR® Catheter B Curve
(Red / 2.0" / 5.1 cm)
A lasso mapping catheter has been passed through the intra-atrial septum and positioned in the left upper pulmonary vein.
PV Ostium vs. Antrum

- LAA
- LSPV
- LIPV
- RSPV
- RIPV
Rapid PV tachycardia (500 bpm)
Slowing of PV tachycardia during ablation
Ablation for Paroxysmal AF

- 3-4 hours
- Overnight stay
- 70% - freedom from AF without antiarrhythmic medications
- 30% - re-do rate
  - Almost always due to PV reconnection
- Serious complications – 1%
Safety of AF ablation

Please Be safe.
Do not stand, sit, climb or lean on zoo fences.
If you fall, animals could eat you and that might make them sick.
Thank you.
Complications

N=1642 procedures
Total complication rate= 3.5%

- Peripheral vascular complication requiring intervention: 1.9%
- Cardiac perforation/tamponade requiring intervention: 1.2%
- Embolic phenomenon including TIA/stroke: 0.2%
- Pulmonary vein stenosis: <0.01%
- DVT: <0.01%

Baman et al JCE 2011
AtrioEsophageal Fistula

- Intense inflammatory response resulting from atrial and esophageal tissue necrosis
- Low incidence
  - <0.3% however mortality rate is >80%

- Symptoms
  - Acute pericarditis
  - Pneumonitis
  - Sepsis
  - Strokes
  - gastrointestinal bleeding

- Immediate evaluation
  - Swallowing difficulties
  - Fevers
  - neurological deficits
  - Sepsis
Indications for RFA

- **Class I**- Patients with significantly symptomatic, paroxysmal AF who have failed treatment with an antiarrhythmic drug and have normal or mildly dilated left atria, normal or mildly reduced LV function, and no severe pulmonary disease.

- **Class IIa**- Patients with symptomatic persistent AF.

2011 ACC/AHA/HRS Update on AF
Comprehensive Atrial Fibrillation Program
Treatment of Atrial Fibrillation

• **Step 1** - Discuss stroke risk
  - High risk patients should take Coumadin, Pradaxa or rivaroxaban
  - Low risk patients should take aspirin 325mg daily if possible
Treatment of Atrial Fibrillation

- Step 2 - Control the heart rate
  - Metoprolol
  - Toprol
  - Diltiazem
  - Verapamilo
  - Digoxin
Treatment of Atrial Fibrillation

Step 3- If quality of life is still decreased despite controlling your heart rate while in atrial fibrillation, then you can consider antiarrhythmic drug therapy.
Treatment Algorithm

Maintenance of Sinus Rhythm

- No (or minimal) heart disease
  - Flecaïnine, Propafenone, Sotalol
    - Amiodarone, Dofetilide
    - Catheter ablation
  - Catheter ablation

- Hypertension
  - Substantial LVH
    - No
      - Flecaïnine, Propafenone, Sotalol
      - Amiodarone, Dofetilide
      - Catheter ablation
    - Yes
      - Amiodarone

- Coronary artery disease
  - Dofetilide, Sotalol
  - Amiodarone

- Heart failure
  - Dofetilide
  - Amiodarone
  - Catheter ablation
Treatment of Atrial Fibrillation

Step 4- If a single antiarrhythmic therapy is unsuccessful at maintaining sinus rhythm, catheter ablation
Conclusions

- Patients with significantly symptomatic, paroxysmal or persistent AF who have failed treatment with an antiarrhythmic drug should be strongly considered for RFA for AF
- Radiofrequency ablation can be performed with a low risk of complication
- Patients should be aware that ≥1 procedure may be necessary for long term success from AF
Thank you