Atrial Fibrillation: Antiarrhythmics, Anticoagulation and Ablation

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Disclosures

- Research grant, honoraria: St Jude Medical
- Research grant, honoraria: Medtronic
- Research grant, honoraria: Biosense-webster
- Research grant: Rhythmia medical
- Research grant, SAB: Voyage medical

Atrial Fibrillation

Demographics by Age

Adapted from Feinberg WM. Arch Intern Med 1995;155:469-473.

Total Hospitalization Days Based on Presenting Arrhythmia

Adapted from Camm AJ. Am J Cardiol 1996;78(8A):3-11.
AF Classification: The Three P’s

<table>
<thead>
<tr>
<th>Paroxysmal</th>
<th>Persistent</th>
<th>Long-Lasting Persistent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminates spontaneously,</td>
<td>Will not terminate spontaneously,</td>
<td>Will not terminate spontaneously,</td>
</tr>
<tr>
<td>usually within 48 hours</td>
<td>but can be electrically cardioverted or</td>
<td>and is refractory to cardioversion</td>
</tr>
<tr>
<td></td>
<td>converted with drugs</td>
<td>Persistent &gt; 1 year</td>
</tr>
</tbody>
</table>

Atrial Fibrillation: Treatment

- Antiarrhythmics
- Anticoagulation
- Catheter Ablation

Management of Atrial Tachyarrhythmias

Antiarrhythmic drugs
- Class IA quinidine, procainamide, disopyramide
- Class IC flecainide, propafenone
- Class III amiodarone, sotalol, ibutilide, dofetilide, dronaderone

Acute Conversion to Sinus Rhythm

**IV:**
- Ibutilide
  - 1 mg over 10 mins.
  - wait 10 mins
  - 2nd mg over 10 mins.

**PO:**
- Propafenone
  - 450 – 600mg po bolus
- Flecainide
  - 200 – 300mg po bolus

AFL: 65%  AF: 40%
QTc ≤ 440ms
Torsade: 2-3%
Rhythm Control Therapies to Maintain Sinus Rhythm

Maintenance of SR

- No (or minimal) heart disease
- Hypertension
- CAD
- HF

- Dronedarone
- Amiodarone
- Dofetilide

- Flecainide
- Propafenone
- Sotalol

- Yes
- Substantial LVH
- Dronedarone
- Amiodarone
- Dofetilide

- No
- Catheter ablation
- Flecainide
- Propafenone
- Sotalol

- Amiodarone
- Dofetilide
- Catheter ablation


Dronedarone

Maintenance of Sinus Rhythm

Permanent Atrial Fibrillation Outcome Study Using Dronedarone on Top of Standard Therapy (PALLAS)

- A randomized, double-blind, placebo controlled, trial for assessing the clinical benefit of dronedarone 400 mg bid on top of standard therapy in patients with persistent AF
- Eligible patients were ≥65 years, in AF for ≥6 months, with ≥1 additional stroke risk factor (stroke, CHF, diabetes mellitus, hypertension)

Source: http://www.fda.gov/Drugs/DrugSafety/ucm264059.htm
**PALLAS: Risk of the First Co-primary Outcome (Stroke, MI, Systemic Embolism, or Death)**


<table>
<thead>
<tr>
<th>Event</th>
<th>Dronedarone N = 1572</th>
<th>Placebo N = 1577</th>
<th>Hazard Ratio</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV death, MI, stroke, systemic embolism*</td>
<td>32 (2)</td>
<td>14 (0.9)</td>
<td>2.3</td>
<td>0.009</td>
</tr>
<tr>
<td>Death, CV hospitalization*</td>
<td>118 (7.5)</td>
<td>81 (5.1)</td>
<td>1.5</td>
<td>0.006</td>
</tr>
<tr>
<td>Death</td>
<td>16 (1)</td>
<td>7 (0.4)</td>
<td>2.3</td>
<td>0.065</td>
</tr>
<tr>
<td>Stroke</td>
<td>17 (1.1)</td>
<td>7 (0.4)</td>
<td>2.4</td>
<td>0.047</td>
</tr>
<tr>
<td>Heart Failure hospitalization</td>
<td>34 (2.2)</td>
<td>15 (1)</td>
<td>2.3</td>
<td>0.008</td>
</tr>
</tbody>
</table>

*Co-primary endpoints

**FDA Response Since PALLAS**

"At this time, patients taking Multaq should talk to their healthcare professional about whether they should continue to take Multaq for non-permanent atrial fibrillation. Healthcare professionals should not prescribe Multaq to patients with permanent atrial fibrillation."


**Ed’s Guidelines**

**Rhythm Control Therapies to Maintain Sinus Rhythm**

Efficacy of Drug Therapy for Prevention of Recurrent AF


Efficacy of Drug Therapy


Adverse Effects of Drug Therapy

Antiarrhythmic Therapy For AF

- Goal is to increase the *likelihood* of maintaining sinus rhythm
- Recurrence of AF is not “failure”
- Agent should be chosen carefully and toxicity monitored
- All QT pronging drugs (except amiodarone) should be started as inpatients
- Check for drug-drug interactions
**AFFIRM**

- 4060 patients at > 200 sites in US and Canada
- Randomized to Heart Rate or Rhythm control
- Patients enrolled 1996 – 1999
- Mean follow-up 3.5 years

- Population
  - Age>65 or
  - Age<65 + at least 1 stroke risk factor

- At least 6 hrs AF documented
- No contraindication to anticoagulation
- Either rate or rhythm control reasonable

---

**Primary Endpoint: All-Cause Mortality**

<table>
<thead>
<tr>
<th>Time (Years)</th>
<th>Rhythm</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>5.0</td>
<td>5.5</td>
</tr>
<tr>
<td>2</td>
<td>10.0</td>
<td>11.0</td>
</tr>
<tr>
<td>3</td>
<td>15.0</td>
<td>16.0</td>
</tr>
<tr>
<td>4</td>
<td>20.0</td>
<td>21.0</td>
</tr>
<tr>
<td>5</td>
<td>25.0</td>
<td>26.0</td>
</tr>
</tbody>
</table>

p = 0.078

- Rhythm N: 2033 1932 1807 1316 780 255
- Rate N: 2027 1926 1827 1329 774 236

---

**Adverse Events (2)**

<table>
<thead>
<tr>
<th>Event Category</th>
<th>Rate Control</th>
<th>Rhythm Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic Stroke</td>
<td>77 (5.5%)a</td>
<td>80 (7.1%)a</td>
</tr>
<tr>
<td>INR ≥ 2.0</td>
<td>23 (31%)</td>
<td>16 (21%)</td>
</tr>
<tr>
<td>INR ≤ 2.0</td>
<td>27 (36%)</td>
<td>17 (22%)</td>
</tr>
<tr>
<td>Not taking warfarin</td>
<td>25 (33%)</td>
<td>44 (57%)</td>
</tr>
<tr>
<td>AF at time of event</td>
<td>42 (69%)</td>
<td>25 (37%)</td>
</tr>
</tbody>
</table>

*aEvent rates derived from Kaplan-Meier analysis, p = 0.79*

---

**Prevalence of Sinus Rhythm at Follow-up**

% in Sinus Rhythm

<table>
<thead>
<tr>
<th>Time</th>
<th>Rate</th>
<th>Rhythm</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>1957</td>
<td>1960</td>
</tr>
<tr>
<td>2M</td>
<td>1927</td>
<td>1945</td>
</tr>
<tr>
<td>4M</td>
<td>1813</td>
<td>1921</td>
</tr>
<tr>
<td>1Y</td>
<td>1831</td>
<td>1840</td>
</tr>
<tr>
<td>2Y</td>
<td>1693</td>
<td>1694</td>
</tr>
<tr>
<td>3Y</td>
<td>1195</td>
<td>1213</td>
</tr>
<tr>
<td>4Y</td>
<td>713</td>
<td>713</td>
</tr>
<tr>
<td>5Y</td>
<td>231</td>
<td>262</td>
</tr>
</tbody>
</table>

Rate N: 2027 1926 1827 1329 774 236
Rhythm N: 2033 1932 1807 1316 780 255
**Reasons to Maintain Sinus Rhythm**

- Symptoms from AF (palps, fatigue, DOE)
- Tachycardia induced cardiomyopathy
- Congestive Heart Failure (AV synchrony)
- ? Stroke risk
- ? Mortality

**Atrial Fibrillation: Treatment**

- Antiarrhythmics
- Anticoagulation
- Catheter Ablation

**CHA\textsubscript{2}DS\textsubscript{2}-VASc Score**

- Patients with paroxysmal AF should be regarded as having a stroke risk similar to those with persistent AF
- The risk of stroke in patients with atrial flutter is similar to AF
### CHA$_2$DS$_2$-Vasc Score

<table>
<thead>
<tr>
<th>CHA$_2$DS$_2$-VASc score</th>
<th>Patients (n=1729)</th>
<th>Adjusted stroke rate (CI/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>1</td>
<td>422</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>


### ESC Recommended Thromboprophylaxis Based on CHA$_2$DS$_2$-VASc

<table>
<thead>
<tr>
<th>Risk category</th>
<th>CHA$_2$DS$_2$-VASc score</th>
<th>Recommended antithrombotic therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>One ‘major’ risk factor or ≥2 clinically relevant non-major risk factors</td>
<td>≥2</td>
<td>OAC$^a$</td>
</tr>
<tr>
<td>One ‘clinically relevant, non-major’ risk factor</td>
<td>1</td>
<td>Either OAC$^a$ or aspirin 75–325 mg daily. Preferred: OAC rather than aspirin.</td>
</tr>
<tr>
<td>No risk factors</td>
<td>0</td>
<td>Either aspirin 75–325 mg daily or no antithrombotic therapy. Preferred: no antithrombotic therapy rather than aspirin.</td>
</tr>
</tbody>
</table>


### Warfarin Risk/Benefit Balance

- **Odds ratio**
  - **International normalized ratio**
- **Warfarin**
  - Ischemic stroke
  - Intracranial bleeding


### HAS-BLED Score

<table>
<thead>
<tr>
<th>Letter</th>
<th>Clinical characteristic$^b$</th>
<th>Points awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>Abnormal renal and liver function (1 point each)</td>
<td>1 or 2</td>
</tr>
<tr>
<td>S</td>
<td>Stroke</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>Bleeding</td>
<td>1</td>
</tr>
<tr>
<td>L</td>
<td>Labile INRs</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>Elderly (e.g. age &gt;65 years)</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>Drugs or alcohol (1 point each)</td>
<td>1 or 2</td>
</tr>
</tbody>
</table>

A score ≥3 indicates “high risk”, and some caution is needed following initiation of oral anticoagulaiton.

Inadequate Warfarin Treatment in Patients with AF

N = 660 with AF in primary care practices

- 65%: No warfarin
- 26%: INR within target
- 4%: INR above target
- 5%: INR below target

6/25/2012


Novel Oral Anticoagulants

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dabigatran</th>
<th>Rivaroxaban</th>
<th>Apixaban</th>
<th>Betrixaban</th>
<th>Edoxaban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanism of action</td>
<td>Thrombin inhibitor</td>
<td>Factor Xa inhibitor</td>
<td>Factor Xa inhibitor</td>
<td>Factor Xa inhibitor</td>
<td>Factor Xa inhibitor</td>
</tr>
<tr>
<td>$T_{1/2}$</td>
<td>14-17 hours</td>
<td>5-9 hours</td>
<td>12 hours</td>
<td>19-24 hours</td>
<td>6-12 hours</td>
</tr>
<tr>
<td>Regimen</td>
<td>bid</td>
<td>qd, bid</td>
<td>bid</td>
<td>qd</td>
<td>qd</td>
</tr>
<tr>
<td>Peak to trough</td>
<td>$-2x$</td>
<td>$12x$ (qd)</td>
<td>$3x$-$5x$</td>
<td>$-3x$</td>
<td>$-3x$</td>
</tr>
<tr>
<td>Renal excretion of absorbed drug</td>
<td>$-80%$</td>
<td>$36%$-$45%$</td>
<td>$25%$-$30%$</td>
<td>$-15%$</td>
<td>$35%$</td>
</tr>
<tr>
<td>Potential for drug interactions</td>
<td>P-glycoprotein inhibitor</td>
<td>CYP3A4 substrate and P-glycoprotein inhibitor</td>
<td>CYP3A4 substrate and P-glycoprotein inhibitor</td>
<td>Not substrate for major CYPs</td>
<td>CYP3A4 substrate and P-glycoprotein inhibitor</td>
</tr>
</tbody>
</table>

CYP3A4 = cytochrome P450 3A4


Prescribing information

<table>
<thead>
<tr>
<th></th>
<th>Dabigatran</th>
<th>Rivaroxaban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication</td>
<td>To reduce the risk of stroke and systemic embolism in patients with non-valvular AF</td>
<td></td>
</tr>
<tr>
<td>Dosage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CrCl &gt;90 mL/min:</td>
<td>150 mg bid</td>
<td>CrCl &gt;50 mL/min:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 mg qd</td>
</tr>
<tr>
<td>CrCl 15–30 mL/min:</td>
<td>75 mg bid</td>
<td>CrCl 15–50 mL/min:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 mg qd</td>
</tr>
</tbody>
</table>

http://bidocs.boehringer-ingelheim.com/BIWebAccess/ViewServlet.s ear=doc&ascentedFolderPath=Prescribin g%20Information/Pis/Pradaxa/Pradaxa.pdf
http://www.xareltohcp.com/sites/default/files/xarelto_0.pdf#zoom=100

Table 2 Recommendation for emerging antithrombotic agents

<table>
<thead>
<tr>
<th>2011 Focused update recommendation</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>New recommendation</td>
</tr>
<tr>
<td>1. Dabigatran is useful as an alternative to warfarin for the prevention of stroke and systemic thromboembolism in patients with paroxysmal to permanent AF and risk factors for stroke or systemic embolization who do not have a prostatic heart valve or hemodynamically significant valve disease, severe renal failure (creatinine clearance &lt;15 mL/min) or advanced liver disease (impaired baseline clotting function).</td>
<td>(Level of Evidence: B)</td>
</tr>
</tbody>
</table>
**AF: Cardioversion Recommendations**

**AF > 48 hours or unclear duration**
Anticoagulate with OAC/coumadin (INR 2-3) for 3 weeks prior to cardioversion and at least 4 wks after CV

or

TEE followed by OAC for at least 4 weeks after cardioversion

**AF<48 hours**
Cardioversion. OAC after CV for CHADS2 > 1.

Don’t stop coumadin in patients with stroke RFs unless clear sx’s and repeated monitoring documents lack of AF !!

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**Cardioversion on Thrombin Inhibitor**


**Catheter Ablation**

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**ACC/AHA/ESC 2006 Atrial Fibrillation Guidelines**

**Rhythm Control Therapies to Maintain Sinus Rhythm**

*If AF paroxysmal and contrindications to Dofetilide and amiodarone and poor ablation candidate*

Evolution of PV Isolation

Importance of Posterior LA for AF Maintenance

Prevention of AT – PV Isolation

Complications of AF Ablation

Updated Worldwide Survey on the Methods, Efficacy, and Safety of Catheter Ablation for Human Atrial Fibrillation
Riccardo Cappato, Hugh Calkins, Shuh-Ann Chen, Wyn Davies, Yoshito Iesaka, Jonathan Kalman, You-Ho Kam, George Klein, Andrea Natale, Douglas Packer, Allan Skanes, Federico Ambrogi and Elia Biganzoli

Table 7. Major Complications in the Overall Population

- 20,825 procedures
- 16,309 patients
Randomized Trials

Prospective, multicenter, randomized (2:1) study of paroxysmal AF ablation

Entry criteria: paroxysmal AF refractory to 1 AAD; 3 episodes in past 6 mos.

167 patients randomized to ablation (106) vs. AAD (61)


ThermoCool AF

- Prospective, multicenter, randomized (2:1) study of paroxysmal AF ablation
- Entry criteria: paroxysmal AF refractory to 1 AAD; 3 episodes in past 6 mos.
- 167 patients randomized to ablation (106) vs. AAD (61)

Days Into Effectiveness Follow-up

RF Ablation vs. AAD

Effectiveness cohort, N=159. Circles in the graph represent 14 censored catheter ablation subjects.

Freedom From AF Recurrence

P<.001

Ablation: 5/103 (4.9%) AAD: 5/57 (8.8%)

PV stenosis 0
AE fistula 0
Stroke/TIA 0
Tamponade 0
Pe Effusion 1
P Embolus 1
CHF 1
Pneumonia 1
Vascular cx 1
AAD intolerance 3
Proarrhythmia 2

ThermoCool AF Trial: 30 day Adverse Events

ThermoCool AF Trial: Conclusions

- This multicenter randomized trial demonstrated the superiority of catheter ablation over ADT in the treatment of patients with paroxysmal AF who did not respond to 1 or more AA drugs.
- Catheter ablation provided significantly better rhythm control and improved QOL with favorable safety profile.
- These findings argue for early use of catheter ablation therapy in symptomatic patients with paroxysmal AF unresponsive to initial attempts with pharmacologic rhythm control.


Arctic Front Cryoballoon

- Two balloons diameters:
  - 23mm & 28mm
- Double balloon system
- Over-the-wire

STOP-AF Trial

Inclusion:
Patients >2 AF episodes in 2 months w/ ECG doc. Of 1 Rx Failure of > 1 AA Rx

AA Rx failure n=304

Randomized
2:1 to ablation vs. Drug Rx

Drug Rx n=82

Drug optimization 30 days

Follow-up
1,3,6,9, & 12 mo

Holters
Weekly
TTMs

Cross-over
n=65

Cryoballoon ablation n=163

Blanking period (90 day)

Primary Effectiveness Analysis

Treatment Success

† 30 days

CRYO 69.9% 114/163

DRUG Rx 7.3% 6/82

P<0.001
**Summary of All Adverse Events (Intention-to-Treat)**

<table>
<thead>
<tr>
<th>Type of Adverse Event</th>
<th>CRYO (n = 163)</th>
<th>DRUG (n = 82)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>4 (2.5%)</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>TIA</td>
<td>3 (1.8%)</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>Tamponade</td>
<td>1 (0.6%)</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>2 (1.2%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Hemorrhage requiring transfusion</td>
<td>3 (1.8%)</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>New atrial flutter</td>
<td>6 (3.7%)</td>
<td>13 (15.9%)</td>
</tr>
<tr>
<td>Atrial esophageal fistula</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Death</td>
<td>1 (0.6%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>New or worsened AV fistula</td>
<td>2 (1.2%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Pseudoaneurysm</td>
<td>1 (0.6%)</td>
<td>1 (1.2%)</td>
</tr>
<tr>
<td>Phrenic nerve palsy</td>
<td>22 (13.5%)</td>
<td>6 (7.3%)</td>
</tr>
<tr>
<td>Persistent phrenic nerve palsy</td>
<td>4 (2.5%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>PV stenosis</td>
<td>5 (3.1%)</td>
<td>2 (2.4%)</td>
</tr>
</tbody>
</table>

**Conclusions**

- Cryoballoon ablation is effective for treating recurrent drug-refractory paroxysmal AF in symptomatic patients.
- Balloon-only ablation is feasible in the majority of patients.

**Endoscopic Laser Balloon Ablation System**

- Steerable sheath
- Compliant balloon
- Endoscope
- Laser
- Console

**Laser Balloon Ablation**
Pivotal Clinical Study of the CardioFocus Endoscopic Ablation System for the Treatment of Symptomatic Paroxysmal Atrial Fibrillation
A Prospective, Randomized Trial

- Up to 25 US Sites
- Up to 385 Enrolled Subjects
- Randomized Study Design
  Endoscopic Laser Ablation vs. RF (Thermocool)

Study Flow

- Day Treatment Initiated = Day 0
- 90 Day Post Treatment Blanking Period
- Primary Endpoint: Free of AF Symptoms
- N = 292 Participants
INCLUSION CRITERIA

• 18 - 75 years of age

• Diagnosed with symptomatic paroxysmal atrial fibrillation (AF), defined as AF with self-terminating episodes lasting no longer then 7 days

• Failure (resistance or intolerance) of one (1) specified Class I, II or III antiarrhythmic drugs (AAD) as evidenced by recurrent symptomatic atrial fibrillation or intolerable side-effects

• Have at least two (2) symptomatic episodes of AF in the six months prior to enrollment

CABANA Trial

Recent-onset AF eligible for ablation or drug therapy
- ≥ 65 years old or
- < 65 years old with ≥ 1 risk factor for CAD or stroke

Primary Ablation (technique at operator discretion)

Discontinued Anticoagulation

Continued Anticoagulation

Drug Therapy (rate or rhythm control [at operator discretion] with anticoagulation)

3000 patients
> 2 years follow up
1º endpoint: all cause mortality

AF Ablation

• Pulmonary vein isolation is an established therapy for paroxysmal AF with expected success rate of 65-85%

• Patients with persistent AF have reasonable success with standard PV isolation. The success rate is lower and need for AA drugs higher compared to pts with paroxysmal AF.

• New ablation technologies may improve efficacy, shorten procedure duration, and reduce complications

HRS/EHRA/ECAS 2007 Expert Consensus Statement on Catheter and Surgical Ablation of Atrial Fibrillation

Indications for Catheter Ablation

• Symptomatic AF refractory or intolerant to at least 1 Class 1 or 3 antiarrhythmic medication

• In rare clinical situations, it may be appropriate as first-line therapy

• Selected symptomatic patients with heart failure and/or reduced ejection fraction

• Presence of a left atrial thrombus is contraindication to catheter ablation of AF

Summary

- AF is the most common supraventricular arrhythmia
- Always consider rate control, conversion to sinus rhythm, and anticoagulation
- Antiarrhythmic drugs have a 50-60% sinus rhythm maintenance rate at 1-year.
- If necessary, choose the antiarrhythmic drug that is the best tolerated with the fewest adverse effects
- The newer anticoagulants are easier to use than warfarin and all are equivalent/superior to warfarin in preventing stroke.
- AF ablation is an accepted therapy (Class I) for symptomatic AF breaking through a single antiarrhythmic drug.

AF Ablation in CHF

- 366 patients with paroxysmal (n=299) or persistent (n=67) AF referred for ablation
- 67/366 (18%) pts with baseline EF ≤ 50% and “controlled” ventricular rate (<90 bpm)
- CAD in 12 pts. and valvular disease in 6 pts.
- Baseline echo in SR following ablation and follow-up echo at 3-6 months


AF Ablation in CHF

Effect of PV Isolation

- LV EF normalized to ≥ 55% in 72% patients

**AF Ablation in CHF**

**Echo Measurements**

![Graph showing changes in LA, LVEDD, LVESD](image)

- Baseline
- Follow up

\*p<0.05


**AF Ablation in CHF**

<table>
<thead>
<tr>
<th>Study</th>
<th>Change (95% CI)</th>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chen (2004)</td>
<td>0.046 (0.032, 0.060)</td>
<td>13.3</td>
</tr>
<tr>
<td>Hsu (2004)</td>
<td>0.210 (0.177, 0.246)</td>
<td>12.1</td>
</tr>
<tr>
<td>Tondo (2004)</td>
<td>0.142 (0.134, 0.146)</td>
<td>13.5</td>
</tr>
<tr>
<td>Gentlesk (2007)</td>
<td>0.140 (0.118, 0.162)</td>
<td>13.0</td>
</tr>
<tr>
<td>Khan (2008)</td>
<td>0.090 (0.055, 0.105)</td>
<td>10.9</td>
</tr>
<tr>
<td>Lubomsky (2008)</td>
<td>0.100 (0.045, 0.155)</td>
<td>10.2</td>
</tr>
<tr>
<td>Nadanov (2008)</td>
<td>0.079 (0.042, 0.106)</td>
<td>13.2</td>
</tr>
<tr>
<td>De Potter (2010)</td>
<td>0.078 (0.043, 0.115)</td>
<td>11.9</td>
</tr>
<tr>
<td>Overall (F = 96.7%, p &lt; 0.001)</td>
<td>0.109 (0.073, 0.145)</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Weights are from random effects analysis.


**PABA-CHF Study**

- 81 pts randomized to PVI or AVJ RFA/BiV pacing

![Graph showing changes in Ejection Fraction and 6-Minute Walk](image)