Atrial Fibrillation: Management Strategies

William M. Miles, MD, FACC, FHRS
Professor of Medicine
Silverstein Chair for Cardiovascular Education
University of Florida College of Medicine
Disclosures

- Medtronic, Inc. (Clinical Events Committee, consultant)
- Biosense-Webster, Boston Scientific, Medtronic, St. Jude
  (UF EP Fellowship Support)
2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Heart Rhythm Society

Developed in Collaboration With the Society of Thoracic Surgeons

Writing Committee Members:

Craig T. January, MD, PhD, FACC, Chair
L. Samuel Wann, MD, MACC, FAHA, Vice Chair*
Joseph S. Alpert, MD, FACC, FAHA†
Hugh Calkins, MD, FACC, FAHA, FHRS *
Joaquin E. Cigarroa, MD, FACC
Joseph C. Cleveland Jr, MD, FACC
Jamie B. Conti, MD, FACC, FHRS*
Patrick T. Ellinor, MD, PhD, FAHA‡
Michael D. Ezekowitz, MB, ChB, FACC, FAHA*
Michael E. Field, MD, FACC, FHRS
Katherine T. Murray, MD, FACC, FAHA, FHRS
Ralph L. Sacco, MD, FAHA

William G. Stevenson, MD, FACC, FAHA, FHRS*¶
Patrick J. Tchou, MD, FACC†
Cynthia M. Tracy, MD, FACC, FAHA‡
Clyde W. Yancy, MD, FACC, FAHA

*Writing committee members are required to recuse themselves from voting on sections to which their specific relationships with industry and other entities may apply; see Appendix 1 for recusal information.
†ACC/AHA Representative. ¶Heart Rhythm Society Representative.
Atrial Fibrillation with Rapid Ventricular Response
Many, but not all, patients with atrial fibrillation have symptoms

- Most commonly fatigue, shortness of breath, exercise intolerance, palpitations
- Symptoms due to:
  - Rapid and irregular ventricular rates
  - Loss of normal AV synchrony
  - Side effects from drugs to treat atrial fibrillation
When atrial fibrillation has already developed, treatment of which of the following is helpful in management of the arrhythmia?

1. Hyperthyroidism
2. Congestive heart failure
3. Sleep apnea
4. Hypertension
5. All of the above
6. None of the above
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1. Hyperthyroidism
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5. All of the above
6. None of the above
Hyperthyroidism is a Reversible Cause of Atrial Fibrillation

Treatment of hyperthyroidism
Atrial Fibrillation Management

AF drugs and ablation are the tip of the iceberg

- Obesity
- Sleep apnea
- Hypertension
- CHF
- Diabetes
- Alcohol
- Exercise
- Atrial myopathy
- Genetics
Long-Term Effect of Goal-Directed Weight Management in an Atrial Fibrillation Cohort

**Figure 2** Atrial Fibrillation Freedom Outcome According to Group

(A) Kaplan-Meier curve for AF-free survival without the use of rhythm control strategies. (B) Kaplan-Meier curve for AF-free survival for total AF-free survival (multiple ablation procedures with and without drugs). Abbreviations as in Figure 1.

Pathak et al. JACC 2015;65:2159
Incidence of AF Based on Presence or Absence of Obstructive Sleep Apnea

Predictors of Recurrence in Patients Undergoing Cryoballoon Ablation for Treatment of Atrial Fibrillation: The Independent Role of Sleep-Disordered Breathing

Figure 1. Kaplan–Meier plot on event-free survival to first ECG documented atrial fibrillation period postpulmonary vein isolation, arranged according to moderate to severe sleep disordered breathing (SDB) versus mild or no sleep disordered breathing (mnSDB).

Bitter et al. J Cardiovasc Electrophysiol 2012;23:18
2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation
Pathophysiology of AF

Triggers
- PV/non-PV Triggers

Substrate
- Electrophysiologic
- Anatomic

Calkins et al. Heart Rhythm 2007
Different Types of AF

First diagnosed episode of atrial fibrillation

- Paroxysmal
  - (usually \( \leq 48 \) h)

- Persistent
  - (>7 days or requires CV)

- Long-standing Persistent
  - (>1 year)

- Permanent
  - (accepted)

Camm A J et al. Eur Heart J 2010
Relationship of AF Mechanism to Clinical Forms

Paroxysmal    Persistent    Permanent

Time course and progression of underlying (heart) disease

Pulmonary Vein

Atria

Triggers/Drivers

Functional reentry substrate

Structural reentry substrate

Evaluation of the Patient With Atrial Fibrillation

- History and physical exam
  - Blood pressure
  - Chest pain, shortness of breath
  - Heart murmur, symptoms/signs of congestive heart failure
  - Symptoms of sleep apnea (snoring, daytime sleepiness)
- Thyroid function studies
- Electrocardiogram/long-term ECG monitoring
- Echocardiogram
  - Heart muscle function
  - Valve function
- Stress test if signs or risk factors for coronary artery disease
Therapeutic Issues to be Addressed in Atrial Fibrillation

1. Prevention of systemic embolization and stroke
2. Slowing of ventricular rate
3. Reversion to sinus rhythm, maintenance of sinus rhythm
A Patient’s View of Warfarin
Strategies for Managing Atrial Fibrillation

- **“Rate control”**: let the patient remain in atrial fibrillation
  - Rate control and anticoagulation
- **“Rhythm control”**: try to keep the patient in sinus rhythm
  - Medicines
    - Success rate ~50%
    - Side effects
  - Non-pharmacologic
    - Catheter ablation
    - Minimally invasive surgical ablation
4,060 AF patients with high risk for stroke and death were randomized to either rhythm control or rate control.
Therapeutic Issues to be Addressed in Atrial Fibrillation

1. Prevention of systemic embolization and stroke
2. Slowing of ventricular rate
3. Reversion to sinus rhythm, maintenance of sinus rhythm
Lenient versus Strict Rate Control in Patients with Atrial Fibrillation (RACE II)

**Primary endpoint:** death from CV causes, hospitalization for HF, stroke, systemic embolism, bleeding, and life-threatening arrhythmic events

![Graph showing cumulative incidence of primary outcome over months for strict and lenient control groups.]

<table>
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<th>No. at Risk</th>
<th>303</th>
<th>282</th>
<th>273</th>
<th>262</th>
<th>246</th>
<th>212</th>
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<td>Lenient control</td>
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<td>290</td>
<td>285</td>
<td>255</td>
<td>218</td>
<td>138</td>
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</tbody>
</table>

Van Gelder et al. NEJM 2010;362:1363
Recommendations for Rate Control

- A heart rate control (resting HR <80 bpm) strategy is reasonable for symptomatic treatment of AF (IIA)
- Lenient rate control strategy (resting HR <110 bpm) may be reasonable with asymptomatic patients and preserved LV systolic function (IIB)

2014 AHA/ACC/HRS AF Guidelines
Therapeutic Issues to be Addressed in Atrial Fibrillation

1. Prevention of systemic embolization and stroke
2. Slowing of ventricular rate
3. Reversion to sinus rhythm, maintenance of sinus rhythm
Patients Not Represented in the AFFIRM Study

- Patients with symptomatic AF
- Patients with LV dysfunction related to AF
- Younger patients facing many years of AF
Potential Benefits of Sinus Rhythm

• Elimination of symptoms
  – Restoration of AV synchrony
  – Appropriate resting and exercise heart rate
  – Regularization of heart rate

• Unproven long-term benefits:
  – Lower risk of thromboembolism
  – Lower risk of CHF
  – Lower risk of progression to permanent AF
  – Improved survival
Oral Drugs Used to Maintain Sinus Rhythm

<table>
<thead>
<tr>
<th>Drug</th>
<th>Type</th>
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<tbody>
<tr>
<td>Quinidine</td>
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<tr>
<td>Disopyramide</td>
<td>Norpace</td>
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<tr>
<td>Flecainide</td>
<td>Tambocor</td>
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<td>Propafenone</td>
<td>Rythmol</td>
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<tr>
<td>Sotalol</td>
<td>Betapace</td>
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<tr>
<td>Dofetilide</td>
<td>Tikosyn</td>
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<tr>
<td>Amiodarone</td>
<td>Cordarone, Pacerone</td>
</tr>
<tr>
<td>Dronedarone</td>
<td>Multaq</td>
</tr>
</tbody>
</table>

Type IA

Type IC

Type III
Drug Therapy for Prevention of Recurrent Atrial Fibrillation

Amiodarone versus Sotalol for Atrial Fibrillation

A All Patients

Amiodarone vs. sotalol, P<0.001
Amiodarone vs. placebo, P<0.001
Sotalol vs. placebo, P<0.001

No. at Risk

<table>
<thead>
<tr>
<th></th>
<th>206</th>
<th>131</th>
<th>98</th>
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<tr>
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Singh et al. NEJM 2005;352:1861
Strategies for Rhythm Control in Patients With Paroxysmal and Persistent AF

2014 AHA/ACC/HRS AF Guidelines

* Catheter ablation is only recommended as first-line therapy for patients with paroxysmal AF (Class IIa recommendation).
† Drugs are listed alphabetically.
‡ Depending on patient preference when performed in experienced centers.
§ Not recommended with severe LVH (wall thickness >1.5 cm).
∥ Should be used with caution in patients at risk for torsades de pointes ventricular tachycardia.
* Should be combined with AV nodal blocking agents.
A patient has had persistent atrial fibrillation with moderately rapid rates for the last 4 months, mild SOB, and the EF on the last echo has decreased to 45%. Assuring adequate anticoagulation, appropriate therapies may include all but:

1. Initiation of strict rate control (resting heart rate <80)
2. Initiation of lenient rate control (resting heart rate <110)
3. Cardioversion
4. Initiation of an antiarrhythmic drug followed by cardioversion
5. Atrial fibrillation ablation
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5. Atrial fibrillation ablation
Catheter Ablation of Atrial Fibrillation
Catheter Ablation For Paroxysmal AF


Courtesy Gregory Michaud MD
Expectations of AF Ablation

• Reduction of symptoms from AF
• Unproven:
  – Cure of AF
  – Better cardiovascular outcomes (CHF, mortality, etc.)
  – Freedom from stroke and the need for anticoagulation
Comparison of Antiarrhythmic Drug Therapy and RF Catheter Ablation in Patients With Paroxysmal AF: Thermocool Study

Procedural Success in the STOP AF Trial

CRYO = 69.9% (114/163)
68.6% KM estimate
(APS + freedom from CT)

DRUG = 7.3% (6/82)
7.3% KM estimate
(Freedom from CTF)

p < 0.001 (exact binomial test of proportions)
p < 0.001 (log rank test, all follow-up)

Packer et al. JACC 2013;61:1713
Single Procedure Freedom from AF, AT and AFL
Arctic Front Advance Cryoballoon Single Center Published Studies

Single Procedure Freedom From AF

Cryoablation vs. RF Ablation

"C'mon, c'mon — it's either one or the other."
Cryoballoon or Radiofrequency Ablation for Paroxysmal Atrial Fibrillation

Kuck et al, NEJM 2016
Cryoballoon or Radiofrequency Ablation for Paroxysmal Atrial Fibrillation

A Primary Efficacy End Point

Hazard ratio, 0.96 (95% CI, 0.76–1.22)
P<0.001 for noninferiority

90-Day blanking period

Patients with Primary Efficacy Event (%)

Days since Procedure

No. at Risk
Cryoballoon
RFC

Kuck et al, NEJM 2016
Long-Term Outcome Following Successful Pulmonary Vein Isolation: Pattern and Prediction of Very Late Recurrence

Starts at one year

AF Ablation Efficacy Depends On Patient Population

• Paroxysmal
• Persistent
• Long-standing persistent
Ablation Strategies for Persistent or Long-Standing Persistent AF

- PVI
- PVI + linear lesions
- PVI + complex fractionated atrial electrograms (CFAEs)
- PVI + linear lesions + CFAEs
- PVI + ablation of focal sources and rotors
- PVI + isolation of LAA
- PVI + ablation of autonomic ganglia
- PVI + isolation of area of fibrosis
- PVI + ....

Adapted from Karl-Heinz Kuck
Catheter Ablation for Persistent AF


Courtesy Gregory Michaud MD
Approaches to Catheter Ablation for Persistent Atrial Fibrillation (STAR AF II)

Approaches to Catheter Ablation for Persistent Atrial Fibrillation

FIRM Ablation

Right Atrium

Left Atrium
FIRM Ablation
CONFIRM (Conventional Ablation for Atrial Fibrillation With or Without Focal Impulse and Rotor Modulation) Trial
Summary of Complex AF Mechanisms

Calkins et. al. Heart Rhythm 2007;4:816-861
Class III: Harm

1. AF catheter ablation should not be performed in patients who cannot be treated with anticoagulant therapy during and following the procedure.

2. AF catheter ablation to restore sinus rhythm should not be performed with the sole intent of obviating the need for anticoagulation.
Complications of AF Ablation (approx. 5%)

- Thromboembolism/air embolism
- Cardiac tamponade
- Pulmonary vein stenosis
- Atrio-esophageal fistula
- Vascular access-related complications
  - Hematoma, pseudoaneurysm, AV fistula
- Left atrial flutters/atrial tachycardia
- Mitral valve trauma/catheter entrapment
- Phrenic nerve injury
- Radiation exposure/skin burns
- Acute coronary artery occlusion
- Periesophageal vagal injury
LUPV Stenosis
Necrotic ulcer within the anterior wall of the oesophagus in close proximity to the left atrial posterior wall 24 h after PVAI.
Left Atrial–Esophageal Fistula After Pulmonary Vein Isolation

Which of the following patients is a good candidate for catheter ablation of atrial fibrillation?

1. 59 y.o. male incidentally found to have asymptomatic AF at a routine physical exam
2. 60 y.o. female with symptomatic paroxysmal AF who cannot take warfarin due to severe gastrointestinal bleeding
3. 55 y.o. male with symptomatic paroxysmal AF recurrent despite flecainide therapy
4. 68 y.o. male CHADS-VASc 3 with minimally symptomatic AF who wishes to discontinue warfarin due to fear of bleeding
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4. 68 y.o. male CHADS-VASc 3 with minimally symptomatic AF who wishes to discontinue warfarin due to fear of bleeding
Which of the following decreases the AF recurrence rate after AF ablation?

- Adequate anticoagulation
- Treatment of sleep apnea
- RF rather than cryoballoon pulmonary vein isolation
- Treatment with proton pump inhibitors
- Increased alcohol intake
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Thank You!