Atrial Fibrillation
Clinical Pearls

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Scope of the A Fib Problem

• Afib affects 2% of US Population, increasing

• Huge
  – Hospitalization Cost
  – Quality of Life

• Causes >15% of all Strokes

• Male > Female

• Incidence Soars with Age
  – 40-50 y/o    0.5%
  – 80 y/o       5-15%
What; Why; Who and How
**What** is Atrial Fibrillation

- Chaotic atrial activity (LA/RA/both)
- Loss of atrial mechanical function
- Significant duration
- Often challenging rate control
- Characteristic Irregularly Irregular Pulse
- Cousin to Atrial Flutter - more organized
Spontaneous Contrast
Types of Atrial Fibrillation

• **Paroxysmal**
  – <48 hours, spont convert to NSR

• **Persistent**
  – >48 hours
  – Requires Cardioversion

• **Permanent**
  – Active Decision

• Levels of Embolic Risk... Similar!
Why does Afib Happen?

2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation: Executive Summary
http://content.onlinejacc.org/article.aspx?articleID=1854230
Who gets Afib?

- Age
- Genetics
- Hypertension
- Valvular Heart Disease
- Thyroid Disease
- Obstructive Sleep Apnea
- Toxic/Metabolic
- Post-Cardiotomy
Obesity as a Predictor of AF

From Wang TJ, JAMA 292:2471-7, 2004
Obstructive Sleep Apnea

- 4X increased risk of AF
- Autonomic dysregulation
- Hypoxia
- LA stretch

Linz et al. Heart Rhythm 2011

Mehra R et al; Sleep Heart Health Study. Am J Respir Crit Care Med. 2006;173:910-916.
How do we treat Afib?

- Anticoagulation?
- Rate control
- Rhythm control
- Treat the patient!
- When to refer to EP?
CHADS\textsubscript{2} Score

- CHF 1
- HTN 1
- **Age > 75** 1
- **Diabetes** 1
- Stroke/TIA 2

- **Total Score**: 0-6

B. Gage, et al., JAMA 2001; 285:2864-70
## CHADS$_2$ Score

### Table 2. Risk of Stroke in National Registry of Atrial Fibrillation (NRAF) Participants, Stratified by CHADS$_2$ Score

<table>
<thead>
<tr>
<th>CHADS$_2$ Score</th>
<th>No. of Patients (n = 1733)</th>
<th>No. of Strokes (n = 94)</th>
<th>NRAF Crude Stroke Rate per 100 Patient-Years</th>
<th>NRAF Adjusted Stroke Rate, (95% CI)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>120</td>
<td>2</td>
<td>1.2</td>
<td>1.9 (1.2-3.0)</td>
</tr>
<tr>
<td>1</td>
<td>463</td>
<td>17</td>
<td>2.8</td>
<td>2.8 (2.0-3.8)</td>
</tr>
<tr>
<td>2</td>
<td>523</td>
<td>23</td>
<td>3.6</td>
<td>4.0 (3.1-5.1)</td>
</tr>
<tr>
<td>3</td>
<td>337</td>
<td>25</td>
<td>6.4</td>
<td>5.9 (4.6-7.3)</td>
</tr>
<tr>
<td>4</td>
<td>220</td>
<td>19</td>
<td>8.0</td>
<td>8.5 (6.3-11.1)</td>
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<tr>
<td>5</td>
<td>65</td>
<td>6</td>
<td>7.7</td>
<td>12.5 (8.2-17.5)</td>
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<tr>
<td>6</td>
<td>5</td>
<td>2</td>
<td>44.0</td>
<td>18.2 (10.5-27.4)</td>
</tr>
</tbody>
</table>

B. Gage et al., JAMA 2001; 285:2864-70
CHADS² score ≥2†

Consider other risk factors*

Age ≥75 years

≥2 other risk factors*

I other risk factor*

OAC

OAC (or aspirin)

Nothing (or aspirin)

†Congestive heart failure, Hypertension. Age ≥ 75 years Diabetes. Stroke/TIA/thrombo-embolism (doubled)

*Other clinically relevant non-major risk factors: age 65–74, female sex, vascular disease
**CHA$_2$DS$_2$VASc Scoring**

- CHF 1
- HTN 1
- Age >75 2
- Diabetes 1
- Stroke/TIA 2
- Vascular Disease 1
- Age >65 1
- Sex Class (female) 1

Score 0-10; 0=low 1=moderate >2 high risk

### CHADS\(_2\) -> CHA\(_2\)DS\(_2\)VASc

<table>
<thead>
<tr>
<th>CHADS(_2) score</th>
<th>Patients ((n = 1733))</th>
<th>Adjusted stroke rate % / year</th>
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<tr>
<td>0</td>
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<td>5</td>
<td>65</td>
<td>12.5</td>
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<td>6</td>
<td>5</td>
<td>18.2</td>
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</table>

<table>
<thead>
<tr>
<th>CHA(_2)DS(_2)-VASc score</th>
<th>Patients ((n = 7329))</th>
<th>Adjusted stroke rate % / year</th>
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<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>422</td>
<td>1.3</td>
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<tr>
<td>2</td>
<td>1230</td>
<td>2.2</td>
</tr>
<tr>
<td>3</td>
<td>1730</td>
<td>3.2</td>
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<tr>
<td>4</td>
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<td>4.0</td>
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<td>9.8</td>
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<tr>
<td>7</td>
<td>294</td>
<td>9.6</td>
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<tr>
<td>8</td>
<td>82</td>
<td>6.7</td>
</tr>
<tr>
<td>9</td>
<td>14</td>
<td>15.2</td>
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# HAS-BLED Scoring

<table>
<thead>
<tr>
<th>Letter</th>
<th>Clinical characteristic*</th>
<th>Points awarded</th>
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<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 (age &gt;65)</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>

Maximum 9 points

R. Pisters et al., *Chest*; Prepublished online March 18, 2010
Antithrombotic Therapy with Afib

2. Assess Thrombo-embolic Risk:
   • $\text{CHADS}_2$ $\geq 2$ OAC
   • $\text{CHADS}_2$ $= 0-2$ Apply $\text{CHA}_2\text{DS}_2\text{VASc}$
   • $\text{CHA}_2\text{DS}_2\text{VASc}$ $\geq 2$ OAC
     • $= 1$ OAC or ASA
     • $= 0$ No Agent
3. Assess Bleed Risk
   • HAS-BLED $>3$ or $> \text{CHADS}_2$ ?no OAC or new Agent
Data on Oral Anticoagulants

- Aspirin
- Plavix
- Warfarin
- Dabigatran
- Rivaroxaban
- Apixaban
Aspirin

• Only one early-terminated trial (Sportif III) showed significant benefit
• Meta-analysis: minimal benefit
• ACC Guidelines: 81-325 mg
• ESC Guidelines 81-100 mg
Trial Design: ACTIVE-W was a randomized trial of clopidogrel (75 mg/day) and aspirin (75 to 100 mg/day) (n=3335) or oral anticoagulant therapy with warfarin (n=3371) among patients with atrial fibrillation. Primary endpoint was composite of stroke, non-CNS systemic embolism, MI, or vascular death, evaluated for non-inferiority.

Results
- Prior oral anticoagulation therapy used in 77% of patients
- Trial discontinued early by data safety monitoring board due to evidence of superiority in primary endpoint with oral anticoagulant therapy (Figure)
- Oral anticoagulant therapy group had ↓ rates of stroke (Figure) and non CNS embolism (0.10% per year vs 0.43% per year, p=0.005)

Conclusions
- Among patients with atrial fibrillation and at least one risk factor for stroke, treatment with oral anticoagulant therapy was associated with reduction in composite of stroke, non-CNS systemic embolism, MI, or vascular death compared with treatment with clopidogrel and aspirin
- Trial discontinued early due to overwhelming efficacy for oral anticoagulant therapy
- Oral anticoagulant therapy can be difficult to use and requires monitoring of INR on a regular basis
- However, present trial confirms the efficacy of oral anticoagulant therapy
Warfarin Has a Narrow Therapeutic Window: Relationship Between Clinical Events and INR

New Oral Anticoagulants (NOACs)

FDA-approved Indications

- **Dabigatran (Pradaxa®)**
  - Stroke prevention in non-valvular Afib (NVAF)

- **Rivaroxaban (Xarelto®)**
  - Stroke prevention in NVAF
  - VTE prophylaxis in hip and knee replacement surgery
  - Treatment of VTE

- **Apixaban (Eliquis®)**
  - Stroke prevention in NVAF
  - Close to getting approval for VTE prophylaxis in hip & knee replacement surgery

Adam Ann Int Med 2012
Rivaroxaban versus Warfarin in Nonvalvular Atrial Fibrillation

Manesh R. Patel, M.D., Kenneth W. Mahaffey, M.D., Jyotsna Garg, M.S., Guohua Pan, Ph.D., Daniel E. Singer, M.D., Werner Hacke, M.D., Ph.D., Günter Breithardt, M.D., Jonathan L. Halperin, M.D., Graeme J. Hankey, M.D., Jonathan P. Piccini, M.D., Richard C. Becker, M.D., Christopher C. Nessel, M.D., John F. Paolini, M.D., Ph.D., Scott D. Berkowitz, M.D., Keith A.A. Fox, M.B., Ch.B., Robert M. Califf, M.D., and the ROCKET AF Steering Committee, for the ROCKET AF Investigators*
ARISTOTLE: Primary Outcome
Stroke (Ischemic or Hemorrhagic) or Systemic Embolism

![Graph showing the comparison between Apixaban and Warfarin in terms of the primary outcome.](image)

- **Apixaban**: 212 patients, 1.27% per year
- **Warfarin**: 265 patients, 1.60% per year

**HR** 0.79 (95% CI, 0.66–0.95); **P (superiority)** = 0.011

**P (noninferiority)** < 0.001

**No. at Risk**

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>6</th>
<th>12</th>
<th>18</th>
<th>24</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apixaban</td>
<td>9120</td>
<td>8726</td>
<td>8440</td>
<td>6051</td>
<td>3464</td>
<td>1754</td>
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<tr>
<td>Warfarin</td>
<td>9081</td>
<td>8620</td>
<td>8301</td>
<td>5972</td>
<td>3405</td>
<td>1768</td>
</tr>
</tbody>
</table>

Rate Control

- Beta Blockers
- Calcium Channel Blockers
- Digoxin
- Amiodarone
Rhythm Control

• Cardioversion

• Antiarrhythmic
  – IC: Flecainide, Propafenone
  – III: Amiodarone, Dronedarone, Sotalol, Dofetilide

• Ablation
  – AV Nodal Ablation “Pace and Ablate”
  – Afib Ablation
Cardioversion Success is Brief

Antiarrhythmics have Limited Success: Canadian Trial of Atrial Fibrillation

Roy et al. NEJM 2000.
Atrial Fib is a Progressive Disease

• >50% of patients with paroxysmal AF develop persistent AF within ten years despite Antiarrhythmics
• AF requires a trigger and a susceptible anatomic Substrate
  – Trigger:
    Muscle fibers extending from pulmonary veins to LA (90%)
• As AF progresses, triggers distribute more throughout the atria

Haissaguerre et al. NEJM 1998
Afib begets Afib

Heart Rhythm 9(4), April 2012
Afib Ablation Approaches
Afib Catheter Ablation Candidates

• Class 1
  – Symptomatic Parox AF failing 1 or more AADs

• Class 2a
  – Symptomatic Pers. AF failing 1 or more AADs
  – Symptomatic Parox AF as first line therapy

• Class 2b
  – Symptomatic Pers AF >12 months, failing AAD
  – Symptomatic Pers AF as first line therapy

• Caveats: Must use anticoagulants; Ablation does NOT obviate need for anticoagulation

2014 AHA/ACC/HRS Atrial Fibrillation Guideline, pp 65,66
CT LA Image/ CARTO LA Image
In Summary

- Identify Afib
- Inpatient/Outpatient?
- Mechanism of Afib
- Anticoagulation Plan
- Rate Control Plan
- Rhythm Control Plan
Posterior View LA/ CARTO Map
LA Views