Atrial Arrhythmia and Atrial Fibrillation Current Approach to Management

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Outline

• Brief Overview of Atrial Arrhythmia
• Definitions
• Diagnosis (ECG/EP)
  – Anticoagulation
  – Rate vs. Rhythm Control
• Ablation
SVT - Narrow Complex Tachycardia

• AVNRT
• AVRT – Orthodromic (Antidromic)
• AT – (IAST, SAR)
SVT- ECG Diagnosis

Short RP Tachycardia
- AVNRT
- Orthodromic AVRT
- Possible: AT with long PR

Long RP Tachycardia
- AVNRT (typical with slowly conducting retrograde physiology or Atypical AVNRT: Fast-Slow or slow-slow
- AVRT (slow AP)
- AT
ECG - AVNRT

- RP < 90 ms
- Usually RP <= 0
- Pseudo S II, III, AVF
- Pseudo R V1 (avR)
- Pseudo Q
- AV or VA block
- P waves are midline and retrograde (p wave in II, III, avF)
AVNRT - EPS

- Evidence of dual AVN physiology preferably with AH jump and AVN echoes
- Initiation always with AH delay
- VA<60 ms
- Concentric atrial activation with earliest A in HBE (Usually)
- On rare occasions AV block or VA block
AVNRT EPS

AV Nodal Echo
AVNRT EP

AH Jump

Pseudo S

Pseudo R
AVNRT
AVNRT with VA block
AVNRT- Management

• Decisions based on symptoms and frequency.

• Conservative management
  – Vagal maneuvers
  – AVN blockers (CCB, BB, Dig)
  – (AAD: Ic, la, III )

• Ablation
Ablation site AVNRT
Orthodromic AVRT ECG

- RP > 90ms
- P waves are suggestive of AP site
- P wave can be “non-retrograde”
- Never AV or VA block
- Ipsilateral BBB – slower CL d/t longer VA
- His Ref VPC resets SVT
Orthodromic AVRT EP

• Initiation requires AV delay
• Activation sequence is not concentric (can be with septal BT- DD with uncommon AVNRT)
• 1:1 VA , can not have AV or VA block
• Ipsilateral BBB prolongs TCL and most importantly VA time
• SVT can be reset or terminated with His Ref VPC
• VA>60 ms
• In case of SVT with concentric A activation requires pacing maneuvers and VPC s to DD from atypical AVNRT.
AVRT Rt sided BT
His Refr VPC resets SVT
His Refractory VPC causing Delay in SVT
His Ref VPC (-70ms) advances an terminates SVT
Spontaneous during SVT
Difficult DD- Septal BT (especially slow and Uncommon AVNRT)

- His Refractory VPC
- V Pacing
- VA svt-VA rva pacing
- VA basal pacing- VA apical pacing
- Para Hisian Pacing
- Preexcitation Index
AVRT- Management

• (Conservative)

• Medical-
  – AVN Blockers: BB or CCB (not in WPW with good antegrade conduction)
  – Antiarrhythmics- Class III, Ia, Ic

• Ablation
Successful Ablation site
Ablation sites
Ablation site ECG
AVRT
Ablation site
Ablation Site
AT-ECG

• \( P > R \)
• Non retrograde P wave
• Automaticity or Triggered Activity
AT ECG Localization

- Left vs Right: Positive in V1, negative in avL
- Inf vs. superior
- Narrow P vs Broad and notched
- Positive P waves in precordium: PV origin
- Negative P waves in precordium - Tricuspid annulus
- Exceptions: MA tachycardia, RSPV, CS
EP Mapping

• More A> V

• Focal AT- (automatic or triggered): Earliest A compared to reference or surface P wave (Q in Unipolar ablation catheter)

• Macro reentrant AT= Entrainment map and line in critical isthmus (example: TV-IVC Isthmus dependent Flutter)
During 1\textsuperscript{st} ablation
View of both atria with ablations
Management

- BB, CCB
- Antiarrhythmics
- Ablation
Ablation site
Atrial Fibrillation

ACC/AHA/ESC 2006 Guidelines for Management of Patients With Atrial Fibrillation (J Am Coll Cardiol 2006;48:854-906)
Expert Consensus Statement on Catheter and Surgical Ablation for AF. (Heart Rhythm June 2007)
Definitions

- **Paroxysmal** - Self Terminating within 7 days
- **Persistent** – Requires Termination (DCCV or AAD) or terminates > 7d
- **Long-Term Persistent** – Lasts longer than 1 yr
- **Permanent=Chronic** – Fails CV or not attempted
Diagnosis

• Based on ECG

• **Assessment of Underlying Causes:**
  – HTN, Valve Heart Disease, Cardiac Function, TSH
  – Other arrhythmia- Flutter, AVRT, AT

• **Assessment of Precipitating Factors:**
  Fever, Hypoxia, Ischemia, Anemia, Alcohol, Drugs.
Acute Management

- **Unstable Patient**: Acute HF, Hypotensive, Ischemic >>> DC Cardioversion
- 200 J shock Biphasic

- **Stable Patient** – New Onset? (<48 hrs), Or > 48 hrs
Acute AF- Less Than 48 Hours

• Preferred Approach- Acute Rate Control and Restoration to NSR on Heparin
  – Preferably by DC Cardioversion
  – Optional by AAD (Guidelines Table and Figure)

• 4 Weeks anticoagulation post DC-CV (Guidelines??)

• Long Term Decisions: - AAD?, Anticoagulation after 4 weeks
Persistent and Long-Term Persistent (Permanent/Chronic) AF

- **Rate vs Rhythm Control**
- Recent Studies with Dronaderone
- Limitations of these studies
### TABLE 7. Trials Comparing Rate Control and Rhythm Control Strategies in Patients With AF

<table>
<thead>
<tr>
<th>Trial</th>
<th>Reference</th>
<th>Patients (n)</th>
<th>AF Duration</th>
<th>Follow-Up (y)</th>
<th>Age (mean ± SD)</th>
<th>Patients in SR*</th>
<th>Rate</th>
<th>Rhythm</th>
<th>Death</th>
<th>Rate</th>
<th>Rhythm</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFFIRM (2002)</td>
<td>296</td>
<td>4060</td>
<td>t/NR</td>
<td>3.5</td>
<td>70±9</td>
<td>35% vs. 63% (at 5 y)</td>
<td>83/2027</td>
<td>93/2033</td>
<td>310/2027</td>
<td>356/2033</td>
<td></td>
</tr>
<tr>
<td>RACE (2002)</td>
<td>293</td>
<td>522</td>
<td>1 to 399 d</td>
<td>2.3</td>
<td>63±9</td>
<td>10% vs. 39% (at 2.3 y)</td>
<td>7/256</td>
<td>16/256</td>
<td>18/256</td>
<td>18/256</td>
<td></td>
</tr>
<tr>
<td>PIAF (2000)</td>
<td>294</td>
<td>252</td>
<td>7 to 360 d</td>
<td>1</td>
<td>61±10</td>
<td>10% vs. 56% (at 1 y)</td>
<td>0/125</td>
<td>2/127</td>
<td>2/125</td>
<td>2/127</td>
<td></td>
</tr>
<tr>
<td>STAF (2003)</td>
<td>343</td>
<td>200</td>
<td>6±3 mo</td>
<td>1.6</td>
<td>66±8</td>
<td>11% vs. 26% (at 2 y)</td>
<td>2/100</td>
<td>5/100</td>
<td>8/100</td>
<td>4/100</td>
<td></td>
</tr>
<tr>
<td>HOT CAFÉ (2004)</td>
<td>344</td>
<td>205</td>
<td>7 to 730 d</td>
<td>1.7</td>
<td>61±11</td>
<td>NR vs. 64%</td>
<td>1/101</td>
<td>3/104</td>
<td>1/101</td>
<td>3/104</td>
<td></td>
</tr>
</tbody>
</table>

*Comparison between rate and rhythm control groups.
†Approximately one third of patients were enrolled with first episode of atrial fibrillation (AF).
AFFIRM indicates Atrial Fibrillation Follow-Up Investigation of Rhythm Management; HOT CAFÉ, How to Treat Chronic Atrial Fibrillation; NR, not reported; PIAF, Pharmacological Intervention in Atrial Fibrillation; RACE, Rate Control Versus Electrical Cardioversion for Persistent Atrial Fibrillation; SR, sinus rhythm; and STAF, Strategies of Treatment of Atrial Fibrillation.
**AFFIRM: Predictors of Mortality**

- **Sinus Rhythm**
  - Risk Ratio: 0.54 (0.42–0.70; P<0.001)

- **Warfarin**
  - Risk Ratio: 0.47 (0.36–0.61; P<0.001)

- **Digoxin**
  - Risk Ratio: 1.50 (1.18–1.89; P<0.001)

- **AA Drugs**
  - Risk Ratio: + 50%

- Risk Ratio: + 41%

*Other significant factors in model: age, CAD, CHF, smoking, stroke/TIA, normal LVEF, MR.*

AF-CHF

Pts with LVEF<35%, CHF, AF

Randomized to Rate vs Rhythm Control
– No differences were found in Death, Stroke rates or HF or combined outcome during 3 yr f/up

In patients with atrial fibrillation and CHF, a routine strategy of rhythm control does not reduce the rate of death from cardiovascular causes, as compared with a rate-control strategy.
Dronedarone is a novel antiarrhythmic drug with electrophysiological properties that are similar to those of amiodarone, but it does not contain iodine and thus does not cause iodine-related adverse reactions.
Dronedarone

• 1000 patients who were hospitalized with symptomatic heart failure and severe left ventricular systolic dysfunction to receive 400 mg of dronedarone twice a day or placebo. The primary end point was the composite of death from any cause or hospitalization for heart failure.
Dronedarone

- trial was prematurely terminated for safety reasons,
- During a median follow-up of 2 months, 8.1% in the Dronedarone group and 12.3% in the placebo group died (hazard ratio in the dronedarone group, 2.13; 95% confidence interval [CI], 1.07 to 4.25; P=0.03).
Athena
HRS 2008, ESC 2008

• 4600 pts with AF or A flutter

• Decline in CV death (25%), arrhythmic death (45%), stroke (34%)

• Not approved yet by FDA ongoing trials to conform these findings
Pts with symptomatic, drug-resistant AF, LVEF of 40% or less, and NYHA class II or III to undergo either PVI or atrioventricular-node ablation with biventricular pacing.
The composite primary end point favored the group that underwent pulmonary-vein isolation, with an improved quality of life at 6 months (P<0.001), a longer 6-minute-walk distance (340 m vs. 297 m, P<0.001), and a higher ejection fraction (35% vs. 28%, P<0.001). In the group that underwent pulmonary-vein isolation, 88% of patients receiving antiarrhythmic drugs and 71% of those not receiving such drugs were free of atrial fibrillation at 6 months.
Pulmonary-vein isolation was superior to atrioventricular-node ablation with biventricular pacing in patients with heart failure who had drug-refractory atrial fibrillation
Long-Term Anticoagulation

- CHADS Score
- Guidelines
<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous stroke or TIA</td>
<td>2.5</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1.7</td>
</tr>
<tr>
<td>History of hypertension</td>
<td>1.6</td>
</tr>
<tr>
<td>Heart failure</td>
<td>1.4</td>
</tr>
<tr>
<td>Advanced age (continuous, per decade)</td>
<td>1.4</td>
</tr>
<tr>
<td>CHADS₂ Risk Criteria</td>
<td>Score</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Prior stroke or TIA</td>
<td>2</td>
</tr>
<tr>
<td>Age &gt;75 y</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1</td>
</tr>
<tr>
<td>Heart failure</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patients (N=1733)</th>
<th>Adjusted Stroke Rate (%/y)* (95% CI)</th>
<th>CHADS₂ Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>1.9 (1.2 to 3.0)</td>
<td>0</td>
</tr>
<tr>
<td>463</td>
<td>2.8 (2.0 to 3.8)</td>
<td>1</td>
</tr>
<tr>
<td>523</td>
<td>4.0 (3.1 to 5.1)</td>
<td>2</td>
</tr>
<tr>
<td>337</td>
<td>5.9 (4.6 to 7.3)</td>
<td>3</td>
</tr>
<tr>
<td>220</td>
<td>8.5 (6.3 to 11.1)</td>
<td>4</td>
</tr>
<tr>
<td>65</td>
<td>12.5 (8.2 to 17.5)</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>18.2 (10.5 to 27.4)</td>
<td>6</td>
</tr>
</tbody>
</table>
# TABLE 10. Antithrombotic Therapy for Patients With Atrial Fibrillation

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>Recommended Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>No risk factors</td>
<td>Aspirin, 81 to 325 mg daily</td>
</tr>
<tr>
<td>One moderate-risk factor</td>
<td>Aspirin, 81 to 325 mg daily, or warfarin (INR 2.0 to 3.0, target 2.5)</td>
</tr>
<tr>
<td>Any high-risk factor or more than 1 moderate-risk factor</td>
<td>Warfarin (INR 2.0 to 3.0, target 2.5)*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Less Validated or Weaker Risk Factors</th>
<th>Moderate-Risk Factors</th>
<th>High-Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female gender</td>
<td>Age greater than or equal to 75 y</td>
<td>Previous stroke, TIA or embolism</td>
</tr>
<tr>
<td>Age 65 to 74 y</td>
<td>Hypertension</td>
<td>Mitral stenosis</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>Heart failure</td>
<td>Prosthetic heart valve*</td>
</tr>
<tr>
<td>Thyrotoxicosis</td>
<td>LV ejection fraction 35% or less</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diabetes mellitus</td>
<td></td>
</tr>
</tbody>
</table>
Ablation of Atrial Fibrillation

AF ablation guidelines HRS/EHRA 2007

• “Catheter ablation of AF in general should not be considered as first line therapy. There is a consensus among the Task Force that the primary indication for catheter AF ablation is the presence of symptomatic AF refractory or intolerant to at least one Class 1 or 3 anti-arrhythmic medication”
Ablation of Paroxysmal AF
Pulmonary Vein Isolation
Ablation of Paroxysmal AF
Pulmonary Vein Isolation

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

• In rare clinical situations, it may be appropriate to perform AF ablation as first line therapy.

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

• The presence of a LA thrombus is a contraindication to catheter ablation of AF.
NEWLY DISCOVERED ATRIAL FIBRILLATION

PAROXYSMAL
Anticoag. PRN
Rx Severe Syx
(CHF, Sync., CAD)

PAROXYSMAL NO SYMP.
R/C & A/C PRN
No Drugs

PAROXYSMAL SYMPTOMS
R/C & A/C PRN
Drugs
Ablation if drug(s) fails

PERSISTENT
Rate Control & Anticoag. PRN
+/- DCCV
+/- Drugs (short-term)

RECURRENT AF
R/C & A/C PRN

PERMANENT
R/C & A/C PRN

PERSISTENT NO SYMP.
R/C & A/C PRN
No Drugs

PERSISTENT SYMPTOMS
R/C & A/C PRN
Drugs
Consider ABL if drug(s) & R/C fail

ACC/AHA/ESC 2006 Guidelines for the Management of Patients With Atrial Fibrillation. JACC.2006;48
Approach in Permanent and Persistent AF

- PVI
- Substrate Modification: Roof line, Posterior Wall Line, Mitral Line, CS Isolation
- CFAE- Complex Fractionated Atrial Electrograms
- Parasympathetic Ganglia Ablation
• 45 pts with drug-ref PAF (6h/d)
• Initiation of AF was mapped by recording the earliest electrical activity preceding the onset

**94% of foci were in PVs**

• During a follow-up period of 8±6 months after ablation, 62% had no AF recurrence
During CS pacing what happens?
## Success Rates in RCTs

<table>
<thead>
<tr>
<th>STUDY (year)</th>
<th>Population</th>
<th>Design</th>
<th>N</th>
<th>12 mo. Success (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jais</td>
<td>Paroxysmal</td>
<td>ABL v. AAD (flec or sotal)</td>
<td>112</td>
<td>75 v. 6</td>
</tr>
<tr>
<td>HRS (2006)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pappone</td>
<td>Paroxysmal or persistent</td>
<td>ABL v. AAD</td>
<td>198</td>
<td>93 v. 35</td>
</tr>
<tr>
<td>APAF JACC (2006)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabile</td>
<td>Paroxysmal or persistent (1/3)</td>
<td>AAD +/- ABL</td>
<td>137</td>
<td>56 v. 9</td>
</tr>
<tr>
<td>CACAF. EHJ (2006)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wazni</td>
<td>Paroxysmal</td>
<td>ABL v. AAD</td>
<td>70</td>
<td>87 v. 47</td>
</tr>
<tr>
<td>RAAFT. JAMA (2005)</td>
<td></td>
<td></td>
<td></td>
<td>(symptomatic)</td>
</tr>
<tr>
<td>Oral, Pappone NEJM (2006)</td>
<td>Persistent</td>
<td>Amio + 2 DCCV in 1st 3 mos. +/- CPVA, amio x 3 mos. post</td>
<td>146</td>
<td>74 v. 58 (4)</td>
</tr>
</tbody>
</table>
12 month %AF Free in RCTs

Ablation

Control

Wazni 2005
Stabile 2006
Jais 2006
APAF-Pappone 2006
Oral (Chronic) 2006
Trials of AF Ablation: % Free of AF at 12 months

OBS: N=1,965; 8 Studies
- 77% Free of AF
- 23% Recurrent AF

RCT: N=517; 4 Studies
- 76% Ablation
- 24% Control
Internal View

Right-sided Pulmonary Veins

Left-sided Pulmonary Veins
What does lasso pacing show?
AF ablation are we done?
Complications of AF Ablation

- Groin Complications
  - AV Fistula
  - Pseudeuaneurysm
  - Hematoma
- Pericardial Effusion/Tamponade
- LA-Esophageal Fistula
- PV Stenosis
- Stroke
A few words on atrial flutter

- Mechanism: Tricuspid dependent or not
- In general similar consideration in management re: anticoagulation
- Much lower threshold for ablation therapy
- Drugs not effective in general
- Ablation very successful in TV-IVC isthmus dependent atrial flutter (95%)
• Non-Isthmus dependent and LA flutter – requires complex EP studies and ablations