Recognition and Treatment of Some Common Arrhythmias

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Recognition and Treatment of Some Common Arrhythmias

- Clinical approach to patients with arrhythmias
- Tools of the trade
- Specific rhythm disturbances
  - Mechanism of impulse formation
  - Recognition
  - Management
- Focus on atrial fibrillation
Salient Points in Approaching Tachycardias

• Clinical substrate of patient (ischemia, CHF, shock)

• Assess ventricular & atrial rates
  – E.g., atrial tachycardia at 200-400 bpm, think atrial flutter
Salient Points in Approaching Tachycardias

• Regular or irregular?
  – Not very descriminative

• **How does arrhythmia start/end?**
Salient Points in Approaching Tachycardias

- “Wide QRS” tachycardia
  - Criterion: QRS duration >110 msec
  - Is there a previous bundle branch block?
  - Does current QRS duplicate that BBB morphology?
    - If so, may consider arrhythmia as SVT with BBB
Symptoms or signs **now** - rhythm strip or **ECG**

Symptoms ~ **daily** – **Holter Monitor**
- Invented by Dr. Norman Holter, 1957
- Records every beat for 24-48 hours
Tools of the Trade

Symptoms less than every 48 hours – **Event Recorder**

- **Continuous loop:** senses continuously, records prn
  - Electrodes attached
  - May keep for weeks

- **Handheld:** may be difficult to use for some
  - May keep for several weeks

- **Implantable:** for rare but severe symptoms
Supraventricular Tachycardias

**Atrial**

Sinus tachycardia  Atrial fibrillation
Atrial flutter  Ectopic atrial tachycardia
Multifocal atrial tachycardia - MAT

**“Junctional” (AV Node)**

AVN re-entrant tach  Junctional tach
Atrial Flutter
Atrial Flutter

- Nearly always a right atrial event
  - Single circuit
  - Atrial waves & cycle length all identical in a given lead
  - “Sawtooth” pattern a weak discriminator
Atrial Flutter

• Responds to AV nodal blocking drugs (slowing of HR), antiarrhythmics, electrical cardioversion, ablation

• **If very rapid tachycardia** has **narrow QRS** & type of SVT unclear: may try adenosine to bring out flutter waves
Atrial Flutter with 1:1 Conduction
Atrial Flutter with 2:1 Conduction
Adenosine in Atrial Flutter
Atrial Fibrillation
• **Multiple wavelets** of electrical activity - of varying morphology and direction - in **both atria**

• Responds to AV nodal blockade, antiarrhythmics, cardioversion, **ablation**

• Rx decision: **AF/rate control** vs. Rhythm control (NSR)
Atrial Fibrillation

- Anticoagulation 70% of time, including in elderly

- **If rate control fails**: consider AV junctional ablation & pacemaker

- **If rhythm control fail**: consider atrial fib ablation
Atrial Fibrillation

Nomenclature

**Paroxysmal:**
Recurrent, intermittent, terminates without specific therapy – self limited

**Persistent:**
Recurrent, sustained, able to be terminated by therapeutic intervention

**Permanent:**
Continuous, cannot be converted electrically or pharmacologically
Clinical Concerns Re: Atrial Fibrillation

➢ What is the cause of the arrhythmia?
  ➢ Treatable? Idiopathic?

➢ How is the arrhythmia tolerated by patient?
  ➢ Does patient know a fib is present?
  ➢ “Asymptomatic atrial fibrillation is common after the initiation of any treatment for atrial fibrillation”

➢ What is the patient’s thromboembolic risk?
  ➢ TE risk increases after 48^o duration
  ➢ Risk factors

Does patient require hospitalization?
Atrial Fibrillation
Therapeutic Goals

• Control ventricular rate

• Prevent thromboembolic events

• Restore sinus rhythm *when appropriate or necessary*
Therapeutic Choices

- Restoration of sinus rhythm vs. rate control and anticoagulation:
  - **AFFIRM Trial**
    - Rhythm-control strategy offers no survival advantage over rate-control strategy
    - Rate-control strategy offers lower risk of adverse drug effects
    - Stroke rates were not different between groups
  - **RACE Study**
    - “Rate control was not inferior to rhythm control”
      - Van Gelder, Hagens, et al
# Sinus Rhythm vs. Rate Control

**Table 2. Indications for a Sinus Rhythm Strategy or Rate Control**

<table>
<thead>
<tr>
<th>Maintenance of sinus rhythm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strong indications</strong></td>
</tr>
<tr>
<td>Patients who have symptoms despite adequate rate control</td>
</tr>
<tr>
<td>Patients who are unable to obtain adequate rate control</td>
</tr>
<tr>
<td><strong>Possible indications</strong></td>
</tr>
<tr>
<td>Patients who are not candidates for anticoagulation</td>
</tr>
<tr>
<td>Patients who wish to remain candidates for curative therapies for atrial fibrillation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rate control and anticoagulation*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with $\geq 1$ risk factor for stroke and minimal symptoms associated with atrial fibrillation</td>
</tr>
</tbody>
</table>

*Patients for whom randomized, controlled trials support a strategy of rate control and anticoagulation as equivalent to rhythm control.*
<table>
<thead>
<tr>
<th>Drug</th>
<th>Daily Dosage</th>
<th>Potential Adverse Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amiodarone‡‡</strong></td>
<td>100 to 400 mg</td>
<td>Photosensitivity, pulmonary toxicity, polyneuropathy, GI upset, bradycardia, torsades de pointes (rare), hepatic toxicity, thyroid dysfunction, eye complications</td>
</tr>
<tr>
<td><strong>Disopyramide</strong></td>
<td>400 to 750 mg</td>
<td>Torsades de pointes, HF, glaucoma, urinary retention, dry mouth</td>
</tr>
<tr>
<td><strong>Dofetilide §</strong></td>
<td>500 to 1000 mcg</td>
<td>Torsades de pointes</td>
</tr>
</tbody>
</table>

‡‡A loading dose of 600 mg per day is usually given for one month or 1000 mg per day for 1 week.
§ Dose should be adjusted for renal function and QT-interval response during in-hospital initiation phase.
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<tr>
<th>Drug</th>
<th>Daily Dosage</th>
<th>Potential Adverse Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flecainide</td>
<td>200 to 300 mg</td>
<td>Ventricular tachycardia, HF, conversion to atrial flutter with rapid conduction through the AV node</td>
</tr>
<tr>
<td>Propafenone</td>
<td>450 to 900 mg</td>
<td>Ventricular tachycardia, HF, conversion to atrial flutter with rapid conduction through the AV node</td>
</tr>
<tr>
<td>Sotalol §</td>
<td>160 to 320 mg</td>
<td>Torsades de pointes, HF, bradycardia, exacerbation of chronic obstructive or bronchospastic lung disease</td>
</tr>
</tbody>
</table>

§ Dose should be adjusted for renal function and QT-interval response during in-hospital initiation phase.
## Pharmacologic Therapy: Rate Control

<table>
<thead>
<tr>
<th>Rest</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Digoxin:</strong></td>
<td></td>
</tr>
<tr>
<td>+++</td>
<td>0</td>
</tr>
<tr>
<td><strong>Diltiazem/Verapamil:</strong></td>
<td></td>
</tr>
<tr>
<td>++++</td>
<td>+++</td>
</tr>
<tr>
<td><strong>Beta Blocker:</strong></td>
<td></td>
</tr>
<tr>
<td>++++</td>
<td>+++</td>
</tr>
</tbody>
</table>

**Caveat:** auscultate heart rate, walk patient down hall
# Atrial Fibrillation
## Antithrombotic Therapy

### TABLE 13. 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>
<tr>
<td>Patient Features</td>
<td>Antithrombotic Therapy</td>
<td>Class of Recommendation</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>-------------------------------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Age less than 60 y, no heart disease (lone AF)</td>
<td>Aspirin (81 to 325 mg per day) or no therapy</td>
<td>I</td>
</tr>
<tr>
<td>Age less than 60 y, heart disease but no risk factors*</td>
<td>Aspirin (81 to 325 mg per day)</td>
<td>I</td>
</tr>
<tr>
<td>Age 60 to 74 y, no risk factors*</td>
<td>Aspirin (81 to 325 mg per day)</td>
<td>I</td>
</tr>
<tr>
<td>Age 65 to 74 y with diabetes mellitus or CAD</td>
<td>Oral anticoagulation (INR 2.0 to 3.0)</td>
<td>I</td>
</tr>
<tr>
<td>Age 75 y or older, women</td>
<td>Oral anticoagulation (INR 2.0 to 3.0)</td>
<td>I</td>
</tr>
<tr>
<td>Age 75 y or older, men, no other risk factors</td>
<td>Oral anticoagulation (INR 2.0 to 3.0) or aspirin (81 to 325 mg per day)</td>
<td>I</td>
</tr>
<tr>
<td>Age 65 or older, heart failure</td>
<td>Oral anticoagulation (INR 2.0 to 3.0)</td>
<td>I</td>
</tr>
<tr>
<td>LV ejection fraction less than 35% or fractional shortening less than 25%, and hypertension</td>
<td>Oral anticoagulation (INR 2.0 to 3.0)</td>
<td>I</td>
</tr>
<tr>
<td>Rheumatic heart disease (mitral stenosis)</td>
<td>Oral anticoagulation (INR 2.0 to 3.0)</td>
<td>I</td>
</tr>
<tr>
<td>Prosthetic heart valves</td>
<td>Oral anticoagulation (INR 2.0 to 3.0 or higher)</td>
<td>I</td>
</tr>
<tr>
<td>Prior thromboembolism</td>
<td>Oral anticoagulation (INR 2.0 to 3.0 or higher)</td>
<td>I</td>
</tr>
<tr>
<td>Persistent atrial thrombus on TEE</td>
<td>Oral anticoagulation (INR 2.0 to 3.0 or higher)</td>
<td>Ila</td>
</tr>
</tbody>
</table>

*Risk factors for thromboembolism include heart failure (HF), left ventricular (LV) ejection fraction less than 35%, and history of hypertension.

AF indicates atrial fibrillation; CAD, coronary artery disease; INR, international normalized ratio; and TEE, transesophageal echocardiography.
Cardioversion

- **Clinical Pearls:**
  - **Electrical** and **pharmacologic** cardioversion (CVN) carry equal thromboembolic risk
  - Elective CVN:
    - INR ≥ 2.0 for at least three weeks pre-CVN
    - Continue warfarin for 4-6 weeks after
  - Add antiarrhythmic if early recurrence/rhythm control chosen
    - Cardiovert again
Multifocal Atrial Tachycardia (MAT)
Multifocal Atrial Tachycardia (MAT)

- **At least three** foci of atrial depolarization/P waves
- Virtually always secondary to another condition
  - COPD exacerbation, ketoacidosis, sepsis, etc.
- **Does not respond to electrical cardioversion**
Multifocal Atrial Tachycardia (MAT)

✓ Rx: *treat inciting condition* to convert to NSR

✓ AVN blockers if rate control required

✓ Amiodarone may convert to NSR or slow rate

✓ May be confused with atrial fibrillation
Ectopic Atrial Tachycardia
Ectopic Atrial Tachycardia

- **One focus** of atrial depolarization, R or L atrium

- Atrial rate 100-200 bpm (may be higher)

- May **convert** with calcium antagonists, B-blockers, antiarrhythmic drugs, DC cardioversion
Ectopic Atrial Tachycardia

- Ventricular rate responds to AV nodal blockade
- “Cured” by RF ablation ~ 85% of time
- Consider digitoxicity as cause
Ectopic Atrial/Low Atrial/Coronary Sinus Rhythm
Sinus and Ectopic Atrial Rhythms
AV Nodal Re-entrant Tachycardia (AVNRT)
**AV Nodal Re-entrant Tachycardia**  
**-(AVNRT)-**

- Re-entrant circuit in AV node  
  - Retrograde P waves usually not detectable
- Converts with vagal maneuvers, AVN blockers, antiarrhythmics, electrical cardioversion
- Usually amenable to ablation
- Similar appearance to **Junctional Tachycardia** but junctional tach most often 20^0 to digitoxicity
JUNCTIONAL TACHYCARDIA
Ventricular Tachycardia

• Multiple mechanisms and forms

• Wide QRS (＞110 msec) – rates 101-300 bpm

• Electrocardiographic clues to diagnosis:
  – Rhythm strip: AV dissociation, fusion or captured beats
Fusion Beat
Late Diastolic PVC/VTach
AV Dissociation
AV Dissociation
**Ventricular Tachycardia**

- **Electrocardiographic clues to diagnosis:**
  - **12 lead EKG: Brugada Criteria**
    - rS complex absent in precordial leads? **If so, likely VT**
    - If rS, duration of **onset** of r to **nadir** of S > 100msec? **If so, VT**
    - AV dissociation? **If so, VT**
    - Typical QRS patterns in V₁, V₆ suggesting aberrancy? **If not, VT**
Ventricular Tachycardia - Rx

• How is patient doing?
  – Emergency synchronized electrical cardioversion if angina, CHF, hypotension/shock

• IV meds: lidocaine (if felt ischemic), amiodarone, procainamide
Ventricular Tachycardia - Rx

- If torsades: withdraw offending agent (^QT) isoproterenol, overdrive pacing
- Synchronized DC cardioversion prn
Tracing Artifact
Often occurs in setting of unstable baseline
Rapid onset/rapid offset
Baseline QRS complex often seen throughout tracing
Motion artifact – patient brushing teeth!
Atrial Fibrillation with WPW

Medical emergency – immediate DC cardioversion