Atrial Dysrhythmias

Fast & Easy ECGs – A Self-Paced Learning Program
Atrial Dysrhythmias

- Originate in the atrial tissue or in the internodal pathways
Atrial Dysrhythmias

• Believed to be caused by three mechanisms:
  – Automaticity
  – Triggered activity
  – Reentry
Atrial Dysrhythmias

• Can affect ventricular filling time and diminish the strength of the atrial contraction
• This can lead to decreased cardiac output and ultimately decreased tissue perfusion
Atrial Dysrhythmias

• Key characteristics include:
  – P’ waves (if present) that differ in appearance from normal sinus P waves
  – Abnormal, shortened, or prolonged P’R intervals
  – QRS complexes that appear narrow and normal
Wandering Atrial Pacemaker

- Pacemaker site shifts between the SA node, atria and/or AV junction
  - This produces its most characteristic feature – $P'$ waves that change in appearance
Wandering Atrial Pacemaker

**Characteristics**

- **Rate**: 60 to 100 beats per minute
- **Regularity**: Slightly irregular
- **P waves**: P’ waves differ, as frequently as from beat to beat, may be upright or inverted, can even be absent
- **QRS complexes**: Normal, all appear the same
- **PR intervals**: Vary, when the P’ wave is present the P’R intervals may be normal, shortened, or prolonged
- **QT intervals**: Within normal range but may vary
Wandering Atrial Pacemaker

• Generally caused by the inhibitory vagal effect of respiration on the SA node and AV junction
• Normal finding in children, older adults, and well-conditioned athletes
• Not usually of any clinical significance
• May be related to some types of organic heart disease and drug toxicity, specifically digitalis
Premature Atrial Complexes (PACs)

- Early ectopic beats that originate outside the SA node
Premature Atrial Complexes (PACs)

- Produce an irregularity in the rhythm
  - P’-P and R’-R intervals are shorter than the P-P and R-R intervals of underlying rhythm
- Have P’ waves that are upright (in lead II) preceding each QRS complex but have a different morphology (appearance) than the P waves of underlying rhythm
- Followed by a noncompensatory pause
Premature Atrial Complexes

- **Rate**: Depends on underlying rhythm
- **Regularity**: Irregular due to early beat
- **P waves**: P' may be upright or inverted, will appear different than those of the underlying rhythm
- **QRS complexes**: Normal
- **PR intervals**: P'R intervals can be normal, shorter than 0.12 seconds in duration, or prolonged
- **QT intervals**: Within normal range but may be shortened
Noncompensatory Pause

- A pause where there are less than two full R-R intervals between the R wave of the normal beat which precedes the PAC and the R wave of the first normal beat which follows it.
Noncompensatory Pause

- When the tip of the right caliper leg fails to line up with the next R wave, it is considered a noncompensatory pause.

1. Measure first R-R interval that precedes the early beat.
2. Rotate or slide the calipers over until the left leg is lined up with the second R wave—mark the point where the tip of the right leg falls.
3. Rotate or slide the calipers over until the left leg is lined up with your first mark.
4. When the tip of the right caliper leg lines up with the next R wave, it is considered a compensatory pause.
## Table 9-1  Premature Atrial Complexes

<table>
<thead>
<tr>
<th>Causes of premature atrial complexes (PACs)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac disorders</td>
<td>Coronary or valvular heart disease, pulmonary disease</td>
</tr>
<tr>
<td>Use of certain drugs</td>
<td>Digitalis toxicity</td>
</tr>
<tr>
<td>Others</td>
<td>Acute respiratory failure, hypoxia, certain electrolyte imbalances, fever, alcohol, cigarettes, anxiety, fatigue, infectious diseases</td>
</tr>
</tbody>
</table>
Premature Atrial Complexes

- Isolated PACs seen in patients with healthy hearts are considered insignificant
- Asymptomatic patients usually only require observation
Premature Atrial Complexes

• May predispose patient with heart disease to more serious atrial dysrhythmias:
  – atrial tachycardia
  – atrial flutter
  – atrial fibrillation

• Can serve as an early indicator of an electrolyte imbalance or congestive heart failure in patients experiencing an acute myocardial infarction
Premature Atrial Complexes

- **Bigeminal**
- **Trigeminal**
- **Quadrigeminal**
Premature Atrial Complexes

• May have wide QRS complexes when seen with abnormal ventricular conduction
  – For this reason they can be confused with PVCs
Atrial Tachycardia

- Rapid dysrhythmia (rate of 150 to 250 BPM) that arises from the atria.
- Rate is so fast it overrides the SA node.
Atrial Tachycardia

Characteristics

**Rate**
- 150 to 250 beats per minute

**Regularity**
- Regular unless the onset is witnessed (thereby producing paroxysmal irregularity)

**P waves**
- P’ waves may be upright or inverted, will appear different than those of the underlying rhythm, can be hidden in the preceding T wave

**QRS complexes**
- Normal, all appear the same

**PR intervals**
- P’R intervals can be normal, shorter than 0.12 seconds in duration or unmeasurable if the P wave can’t be distinguished from the preceding T wave

**QT intervals**
- Within normal range but may be shortened
# Atrial Tachycardia

## Table 9-2  Atrial Tachycardia

<table>
<thead>
<tr>
<th>Causes of atrial tachycardia</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinus node disease</td>
<td>Sick sinus syndrome</td>
</tr>
<tr>
<td>Cardiac disorders</td>
<td>Myocardial infarction, cardiomyopathy, congenital anomalies, Wolff-Parkinson-White syndrome, valvular heart disease, systemic hypertensive, cor pulmonale</td>
</tr>
<tr>
<td>Use of certain drugs</td>
<td>Digitalis toxicity (the most common cause)</td>
</tr>
<tr>
<td>Others</td>
<td>Hyperthyroidism</td>
</tr>
</tbody>
</table>
Atrial Tachycardia

- May occur in short bursts or may be sustained
- Short bursts are well-tolerated in otherwise normally healthy people
- With sustained rapid ventricular rates, ventricular filling may not be complete during diastole
Atrial Tachycardia

• Can significantly compromise cardiac output in patients with underlying heart disease

• Fast heart rates increase oxygen requirements
  – May increase myocardial ischemia and potentially lead to myocardial infarction
Multifocal Atrial Tachycardia (MAT)

• Pathological condition that presents with changing P wave morphology and heart rates of 120 to 150 BPM
Supraventricular Tachycardia (SVT)

- Arises from above the ventricles but cannot be definitively identified as atrial or junctional tachycardia because the P' waves cannot be seen sufficiently.
- Includes paroxysmal supraventricular tachycardia, (PSVT), nonparoxysmal atrial tachycardia, multifocal atrial tachycardia.
Atrial Flutter

• Rapid depolarization of a single focus in the atria at a rate of 250 to 350 BPM

Ventricular rate may be slow, normal or fast; atrial rate is between 250 and 350 beats per minute

Rhythm may be regular or irregular

P waves absent, instead there are saw-tooth flutter waves

QRS complexes are normal and all look alike

P'R intervals are absent
Atrial Flutter

- Produces atrial waveforms that have a characteristic saw-tooth appearance
  - Called flutter waves (F waves)
## Atrial Flutter

### Table 9-3  Atrial Flutter

<table>
<thead>
<tr>
<th>Causes of atrial flutter</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac disorders</td>
<td>Conditions that enlarge atrial tissue and elevate atrial pressures, following cardiac surgery, severe mitral valve disease, cardiomyopathy, pericarditis, myocarditis, hypertrophy, CHF, acute infarction</td>
</tr>
<tr>
<td>Others</td>
<td>COPD, hypoxia, digitalis toxicity, hyperthyroidism, infection, catecholamine release during exercise; may also occur in healthy people who use coffee, alcohol, or cigarettes to an excess or who are fatigued and under stress</td>
</tr>
</tbody>
</table>
Atrial Flutter

- Often well-tolerated
- The number of impulses conducted through the AV node determines the ventricular rate (i.e. 3:1 conduction ratio)
  - Slower ventricular rates (< 40 BPM) or faster ventricular rates (> 150 BPM) can seriously compromise cardiac output
Atrial Fibrillation

- Chaotic, asynchronous firing of multiple areas within the atria
Atrial Fibrillation

- Totally irregular rhythm with no discernible P waves; instead, there is a chaotic baseline of fibrillatory waves (f waves) representing atrial activity.
## Atrial Fibrillation

### Table 9-4  Atrial Fibrillation

<table>
<thead>
<tr>
<th>Causes of atrial fibrillation</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac disorders</td>
<td>Following cardiac surgery, mitral regurgitation, mitral stenosis, chronic coronary artery disease, myocardial infarction, pericarditis, atrial septal defects, pulmonary embolism</td>
</tr>
<tr>
<td>Use of certain drugs</td>
<td>Digitalis toxicity, aminophylline</td>
</tr>
<tr>
<td>Increased vagal tone</td>
<td>Valsalva's maneuver, carotid sinus massage, vomiting</td>
</tr>
<tr>
<td>Others</td>
<td>Hypoxia, hyperthyroidism, infection, catecholamine release during exercise; may also occur in healthy people who use coffee, alcohol, or cigarettes to excess or who are fatigued and under stress</td>
</tr>
</tbody>
</table>
Atrial Fibrillation

- Leads to loss of atrial kick decreasing cardiac output by up to 25%
- Patients may develop intra-atrial emboli as the atria are not contracting and blood stagnates in the atrial chambers forming a thrombus (clot)
  - Predisposes patient to systemic emboli (stroke)
Practice Makes Perfect

- Determine the type of dysrhythmia

Rate: ________ (atrial) ________ (ventricular)  
P waves: ________  QRS complexes: ________  
QT intervals: ________  Dysrhythmia: ________
Practice Makes Perfect

- Determine the type of dysrhythmia

Rate: __________ (atrial) __________ (ventricular)
P waves: __________ QRS complexes: __________
QT intervals: __________ Dysrhythmia: __________
Regularity: __________
PR intervals: __________
Practice Makes Perfect

• Determine the type of dysrhythmia

Rate: ___________ (atrial) ___________ (ventricular)
P waves: ___________ QRS complexes: ___________
QT intervals: ___________ Dysrhythmia: ___________
Regularity: ___________
PR intervals: ___________
Practice Makes Perfect

• Determine the type of dysrhythmia

Rate: __________ (atrial) __________ (ventricular)
P waves: __________ QRS complexes: __________
QT intervals: __________ Dysrhythmia: __________
Regularity: __________
PR intervals: __________
Practice Makes Perfect

- Determine the type of dysrhythmia

Rate: ___________ (atrial) ___________ (ventricular)  
P waves: ______________  QRS complexes: ______________  
QT intervals: ______________  Dysrhythmia: ______________  
Regularity: ______________  PR intervals: ______________
Practice Makes Perfect

• Determine the type of dysrhythmia
Practice Makes Perfect

- Determine the type of dysrhythmia

| Rate: ___________ (atrial) ___________ (ventricular) | Regularity: ___________
| P waves: ___________ | QRS complexes: ___________
| QT intervals: ___________ | PR intervals: ___________
| Dysrhythmia: ___________ |
Practice Makes Perfect

- Determine the type of dysrhythmia

Rate: ____________ (atrial) ____________ (ventricular)
P waves: ____________ QRS complexes: ____________
QT intervals: ____________ Dysrhythmia: ____________
Regularity: ____________
PR intervals: ____________
Practice Makes Perfect

- Determine the type of dysrhythmia

| Rate: _________ (atrial) _________ (ventricular) | Regularity: __________ |
| P waves: __________ | QRS complexes: __________ |
| QT intervals: __________ | Dysrhythmia: __________ |
| PR intervals: __________ |
Practice Makes Perfect

• Determine the type of dysrhythmia

Rate: ____________ (atrial) ____________ (ventricular)
P waves: ____________
QRS complexes: ____________
QT intervals: ____________
Dysrhythmia: ____________

Regularity: ____________
PR intervals: ____________
Summary

• Atrial dysrhythmias originate outside the SA node in the atrial tissue or in the internodal pathways.

• Three mechanisms responsible for atrial dysrhythmias are increased automaticity, triggered activity and reentry.

• Key characteristics for atrial dysrhythmias:
  – P’ waves (if present) that differ from sinus P waves.
  – Abnormal, shortened, or prolonged P’R intervals.
  – QRS complexes that appear narrow and normal (unless there is an intraventricular conduction defect, aberrancy or preexcitation).
Summary

• With wandering atrial pacemaker the pacemaker site shifts between the SA node, atria and/or AV junction.
  – Produces its most characteristic feature, P’ waves that change in appearance.

• Premature atrial complexes (PACs) are early ectopic beats that originate outside the SA node.
  – Produce an irregularity in the rhythm.
  – P’ waves should be an upright (in lead II) preceding the QRS complex but has a different morphology than the P waves in the underlying rhythm.
Summary

- Atrial tachycardia is a rapid dysrhythmia (rate of 150 to 250 beats per minute) that arises from the atria.

- Multifocal atrial tachycardia (MAT) is a pathological condition that presents with the same characteristics as wandering atrial pacemaker but has heart rates of 120 to 150 beats per minute.

- Supraventricular tachycardia arises from above the ventricles but cannot be definitively identified as atrial or junctional because the P’ waves cannot be seen with any real degree of certainty.
Summary

- Atrial flutter is a rapid depolarization of a single focus in the atria at a rate of 250 to 350 beats per minute.
  - Produces atrial waveforms that have a characteristic saw-tooth or picket fence appearance.

- Atrial fibrillation occurs when there is chaotic, asynchronous firing of multiple areas within atria at a rate greater than 350 beats per minute.
  - Produces a totally irregular rhythm with no discernible P waves.