Cardiology Flash Cards

EKG in a nut shell

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Conduction System

- Sinoatrial (SA) Node
  - RA = Right Atrium
  - RV = Right Ventricle
  - LA = Left Atrium
  - LV = Left Ventricle

- Atrioventricular (AV) Node
Analyzing EKG

Step by step
Steps in Analyzing ECG'S

1. **Rhythm:**
   - Regular _ “Sinus, Junctional or Ventricular”.
   - Irregular _ “Regular irregularity, or irregular irregularity”

2. **Rate:**
   - Normal _ (60-100 BPM)
   - Bradycardia _ ( less than 50)
   - Tachycardia _ ( More than 100)
3. P-Wave:
- normally “well rounded, followed by QRS.
- +ve in leads “I, II, V4 & V6”, -ve in “avF”
- Biphasic in “V1”.
- Should not exceed 2-3 mm.
- Its duration “.11 sec”
- Abnormality: “Notched, wide, _ amplitude”
- Best lead to evaluate is “II”.
Steps in Analyzing ECG'S

4. **PR-interval**:  
   - Normally: “Isoelectric” (0.12-0.20 sec)  
   - Abnormality:  
     a. Short _ WPW “Delta Wave”  
     b. Prolonged _ 1° AV block
Steps in Analyzing ECG'S

5. **QRS complex**:
   i. Duration _“0.06-0.10” sec. [2 boxes]
   ii. Amplitude _standard LL > 5 mm
      _ CL V1, V6 = 5 mm
      _ CL V2 V5 = 7 mm
      _ CL V3 V4 = 9 mm
   iii. Timing of intrinsicoid deflection “the length of time that allow the impluse to travel from endo -> epicardium.
   iv. R-wave progression in the chest leads.
Analysis of Rhythm

- **Prolongation** over 0.2 seconds suggests a delay in the conduction system between the SA node and the AV node indicating a first degree heart block. When it takes two or three P-waves to initiate a QRS complex this is termed a 2:1 or 3:1 type second degree heart block. When the P-R interval becomes progressively longer until a QRS complex is dropped and then the process repeats, this is called a *Wenckebach phenomenon*, (a type of second degree Mobitz I block). If the QRS complex is periodically blocked without lengthening of the P-R interval this is called a *Mobitz II block*.

- A **third degree block** exists when the P and the QRS waves are entirely disassociated. These blocks often result from interference along some part of the His-Purkinje system which can usually be located by examining the chest leads such as VI-V6 to determine if it is a right or left bundle branch block as well as its type.
EKG Axis in a Glance

- Using leads I and aVF the axis can be calculated to within one of the four quadrants at a glance.

- If the axis is in the "left" quadrant take your second glance at lead II.
AXIS IN A GLANCE

- both I and aVF +ve = normal axis
- both I and aVF -ve = axis in the Northwest Territory
- lead I -ve and aVF +ve = right axis deviation
- lead I +ve and aVF -ve
  - lead II +ve = normal axis
  - lead II -ve = left axis deviation
Criteria of 1° A-V Block

- Prolongation of A-V conduction time (P-R) interval to 0.21 or more.
- P-R interval usually represents delay in the AVN, but at times it may reflect delays either above “Intra-atrial” or below “HIS – Purkinje” the node.
First degree AV block can be due to:

- Inferior MI,
- Digitalis toxicity
- Hyperkalemia
- Increased vagal tone
- Acute rheumatic fever
- Myocarditis.
2º A-V Block

- When some of the atrial impulses fail to reach the ventricle because of impaired conduction.

- **Types:**
  - Type I “Wenckebach”
  - Type II “Mobitz”
Type I “Mobitz I” “Wenckebach”

- Prolonged P-R interval prior the drop {P} wave
- Associated with:
  - Rheumatic HD
  - Acute inferior MI
  - Digitalis or Propranolol effect.
- Chronic 2° type (I) associated with:
  - Chronic Ischemic HD
  - Aortic Valve disease.
  - Mitral Valve Prolapse.
  - ASD “Atrial Septal Defect”
  - Amyloidosis.
Second degree AV block type I occurs in the AV node above the Bundle of His.

Treatment is usually not indicated as this rhythm usually produces no symptoms.
Type II “Mobitz II”

- It is usually associated with constant prolonged PR interval followed by one P wave is not conducted to the ventricles.
- QRS usually widened because this is usually associated with a bundle branch block.
- This block usually occurs below the Bundle of His and may progress into a higher degree block.
Type II “Mobitz II”

- It can occur after an acute anterior MI due to damage in the bifurcation or the bundle branches.
- It is more serious than the type I block.
- Treatment is usually artificial pacing.
Third Degree Heart Blocks (Complete AV Dissociation)

- Third degree blocks are characterized by a complete AV nodal block resulting in no depolarization of the ventricles (i.e. no ventricular contraction takes place).
- The electrical signal from the SA node is blocked between the atria and ventricles of the heart. This conduction dysfunction generally occurs between the AV junction and the bundle of His.
- Therefore, the ventricles must create their own impulse in order for contraction to occur. Both the atria and ventricles function as two separate units each with its own rate (atria, 60 bpm and ventricles, 20-40 bpm).
- This is a lethal dysrhythmia due to the fact that it can evolve into ventricular standstill or asystole. Since the independent firing rate of the ventricles is 20-40 bpm, perfusion of the entire system will not be adequate enough to sustain life. Causes of third degree heart block include Digitalis toxicity, MI and massive heart disease. Patients with third degree heart block usually need a pacemaker.
Hemi-Block

Anterior Hemi-Block
1. LAD (-60°)
2. Small Q Lead (I)
   Small R Lead (III)
   Deep S Lead (III)
3. Normal QRS
4. Delayed internsicoid in aVL

Posterior Hemi-Block
1. RAD (+120°)
2. Small R Lead (I)
   Small S Lead (III)
   Small Q Lead (III)
3. Normal QRS
4. No evidence of RVH
### HINTS:

<table>
<thead>
<tr>
<th>LEAD</th>
<th>L I</th>
<th>L aVL</th>
<th>L II</th>
<th>L III</th>
<th>L aVF</th>
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<tbody>
<tr>
<td>Anterior</td>
<td></td>
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<tr>
<td>AHB</td>
<td>+</td>
<td>+</td>
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<td>Posterior</td>
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<td>PHB</td>
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# Bundle Branch Block

**LBBB**

- V1 QS or rS
- V6 Late intrinscoid & No (Q) wave
- L1 Morophasic ® wave, No (Q) wave

**RBBB**

- V1 late intrinscoid, M shaped QRS (RSR’), sometimes wide (R)
- V6 Early intrinscoid, wide (S) wave
- L1 Wide (S) wave

In Both (QRS) is 0.12 Secs. Or more
Incomplete Bundle Branch Block

- Same criteria for LBBB & RBBB, But the QRS is (0.09 – 0.11) Secs
Intraventricular Conduction Defect “Delay” (IVCD)

- **Wide QRS > 0.10 Secs**
  - A lesion in the ventricular conduction, slower spread of activation through out the ventricle.
  - “Always check (P) wave & (PR) preceeding each abnormal QRS, to differentiate between Supraventricular & Ventricular rhythm.

- **Prolonged QT Interval**
Atrial premature Beats (APB)

- Ectopic focus discharges an early impulse other than SAN

Criteria:

1. Premature (early).
2. Different looking (P) wave.
3. Followed by long internal but not a fully compensatory pause.
4. Can result in drop (P), with Non-conducting APB
Prematura Atrial Contraction (PAC)

Scale: 200ms/div. || R-R Time (min/avr/max): 638 / 940 / 1168ms || St. Dev. 135ms || Pulse (10 sec. avr.): 64bpm
Premature ventricular Beat

- Timing -» early (Premature)
- (P) wave -» absent, or retrograde.
- QRS -» wide & Bizarre
- Compensatory pause following QRS.

Types:
1. (R on T) malignant VPC -» Very early
2. Interpolated VPC -» doesn’t interrupt the normal rhythm manner, sandwiched between (2) sinus beat.
3. End diastolic -» shortened PR interval & there is no relation between P & QRS
PVCs {CONT.}

- Another classification for VPCs:
  - Unifocal → Look alike.
  - Multifocal → Looks different.

- Timing of occurrence:
  - Bigiminy (2 PVCs) Couplets.
  - Trigiminy (3 PVCs) Triplets
  - Quadgiminy (short run of VT)
Abnormal Heart Rhythm

Cardiac Arrhythmia
Paroxysmal atrial tachycardia (PAT)

- Rate: 150-250 / Min
- QRS: Normal in configuration.
- P wave: not visible.
- After accompanied by non-specific ST-T wave changes.
Multifocal “Chaotic” atrial rhythm

- Caused by rapid firing of two or more ectopic atrial focus.
- Rate: 100-200 / Min
- (P) waves are different in configuration.
- (PR) intervals varies from one beat to another.
- (QRS) is normal.
Atrial Tachycardia
Atrial Flutter

Atrial flutter is usually associated with mitral valve disease, pulmonary embolism, thoracic surgery, hypoxia, electrolyte disturbances and hypercalcaemia. Atrial flutter results in poor atrial pumping since some parts of the atria are relaxing while other parts are contracting. Cardiac output decreases because the ventricles do sufficiently fill (as they would normally) before ventricular contraction. Ablation of some of the heart tissue to stop impulses from travelling around can be used to treat this condition.
Atrial Flutter

- Atrial flutter occurs when the atria are stimulated to contract at 200-350 beats per minute
- The atrial flutter waves, known as F waves, F waves are larger than normal P waves and they have a saw-toothed waveform. Not every atrial flutter wave results in a QRS complex (ventricular depolarization) because the AV node acts as a filter.
- A whole number fixed ratio of flutter waves to QRS complexes can be observed, for instance 2:1, 3:1 or 4:1.
Atrial Fibrillation

- **Multifocal** (F) waves replacing (P) wave either coarse or fine.
- **Rate** (350-650) BPM
- **Irregularly irregular** ventricular response.
- QRS resembles QRS of dominant rhythm.
AV Nodal Re-entry Tachycardia

Abnormal circular conduction in the AV Node.
WPW “Accessory Pathway”

- An extra connection (accessory pathway) is present between the upper chamber (atrium) and lower chamber (ventricle). Patients with such a connection are said to have the Wolff-Parkinson-White syndrome (WPW). The extra connection is shown here during normal sinus rhythm.
Here, the extra connection is seen being used to complete a circuit which causes the tachycardia. The electrical impulse flows down the normal AV node from the atrium to the ventricle, then returns back to the atrium via the accessory pathway, which acts as a "short circuit" to perpetuate the arrhythmia.
Ventricular Tachycardia
Ventricular Fibrillation

- Ventricular fibrillation occurs when parts of the ventricles depolarize repeatedly in an erratic, uncoordinated manner.
- The EKG in ventricular fibrillation shows random, apparently unrelated waves. Usually, there is no recognizable QRS complex.
Atrial enlargement

- **P-Pulmonale** -→ narrow, pointd (P) wave in limb & Rt. Chest leads.
- **P-Tricuspidale** -→ tall & notched with 1st peak taller then 2nd.
- **RAE**: small QRS voltage in V1 with abrupt increase (x3) in QRS voltage in V2.
- **LAE**: P wave widened to 0.12 sec, notched (P) wave in limb leads + (-ve) terminal widened & deeper (P terminal force).
- **P-Mitrale** -→ terminal (P) in V1, L3, aVF. _duration > 0.04 sec._
Ischemia, Injury, and Necrosis

When blood flow is compromised, the affected area of the heart is unable to conduct electrical impulses normally. This results in characteristic changes on the ECG, representing the degree of functional insult:

- **Ischemia** — *T-wave* inversion, ST-segment depression
- **Injury** — ST-segment elevation
- **Necrosis (or infarction)** — Q waves

![ECG images showing T-wave inversion, ST-segment depression, ST-segment elevation, and necrosis with Q waves]
<table>
<thead>
<tr>
<th>Location of Infarct</th>
<th>Arterial Supply</th>
<th>Look for: Indicative Changes in Leads</th>
<th>Reciprocal Changes in Leads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior</td>
<td>LAD</td>
<td>V1-V4</td>
<td>II, III, aVF</td>
</tr>
<tr>
<td>Inferior</td>
<td>RCA</td>
<td>II, III, aVF</td>
<td>I, aVL</td>
</tr>
<tr>
<td>Lateral</td>
<td>Circumflex</td>
<td>I, aVL, V5, V6</td>
<td>V1</td>
</tr>
<tr>
<td>Posterior</td>
<td>Posterior Leeward (RCA)</td>
<td>None</td>
<td>V1, V2</td>
</tr>
<tr>
<td>Septal</td>
<td>Septal perforating (LAD) Posterior descending (RCA)</td>
<td>Loss of R wave in V1, V2, or V3</td>
<td>None</td>
</tr>
</tbody>
</table>

Remember, ST-segment changes in V1 and V2, both elevation and depression, are always significant but not always specific (e.g., ST elevation seen with LVH).
PRACTICE Makes Perfect

ECG library
Normal EKG
1\textsuperscript{st} Degree AV Block
Complete Heart Block
Inferior MI, Sinus Bradycardia
Sinus Tachycardia
Atrial Premature Beat
Atrial Fibrillation with ??
Should we call a code!?
Atrial flutter with reentry circuit
Important Mimikar
PVC & Long QT
VT with clear dissociation
What is that?
Acute Inferior MI
Acute Anterior MI
Old Inferior MI
Acute MI with LBBB
RBBB, What else!

ECG strips showing various leads and rhythms.