Miscellaneous Stuff

Keep reading the “Outline”
Welcome to the “5-Step Method”

1. Compute the 5 basic measurements: HR, PR interval, QRS duration, QT interval, Axis
2. What’s the basic rhythm and other rhythm statements (e.g., PACs and PVC’s)
3. Any conduction abnormalities (SA blocks, AV blocks (Types I or II), and IV blocks)
4. Waveform abnormalities beginning with P waves, QRS complexes, ST-T, and U waves
5. Final interpretations: Normal ECG or Borderline or Abnormal ECG (list final conclusions)
26 year old woman in E.R. with new onset palpitations
Measurements:

- A: V ~230
- PR: 
- QRS: 100-130
- QT: ~260
- Axis: -30

Rhythm (s):
Atrial fibrillation with very rapid ventricular response; note that some RR intervals indicate >300 bpm (seen with accessory AV pathways)

Conduction:
Variable IVCD

Waveform:
LBBB-like QRS morphologies with mostly opposite ST-T direction

Interpretation:
Abnormal ECG:
1) Rhythm and rate
2) Variable QRS morphology suggesting variable fusion in the setting of preexcitation (WPW)
26 year old woman in E.R. with new onset palpitations (after cardioversion)
Measurements: | Rhythm(s): | Conduction: | Waveform: | Interpretation: |
---|---|---|---|---|
A=120  V=120 | Sinus tachycardia | • Short PR  • Slight IVCD | • Subtle delta waves present  • ST depression I, aVL, V3-6  • Q's in II, III, aVF (but are they really Q waves?).... I mean, she's only 25 years old! | Abnormal ECG: 1. Rate (sinus tachycardia) 2. WPW type preexcitation with secondary ST changes
PR=110 | | | |
QRS=110 | | | |
QT=300 | | | |
Axis=-15 | | | |
26 year old woman in E.R. with new onset palpitations (later in the day)
**Measurements:**

<table>
<thead>
<tr>
<th>A= 80</th>
<th>V=80</th>
<th>PR=100</th>
<th>QRS=120</th>
<th>QT=360</th>
<th>Axis=-20</th>
</tr>
</thead>
</table>

**Rhythm (s):**
Sinus rhythm

**Conduction:**
- Short PR
- IVCD

**Waveform:**
- Delta waves
- ST depression I, aVL, V6
- Pseudo Q waves in II, III, aVF (they are negative delta waves)

**Interpretation:**

Abnormal ECG
1. WPW preexcitation with secondary ST-T changes. Note subtle change from previous ECG (1b) indicating more QRS fusion (wider QRS) and shorter PR.
This patient has interesting AV relationships: blocks, dissociations, and escapes
• Take out your calipers!
Incomplete AV Dissociation due to 2\textsuperscript{nd} degree AV block with one sinus capture

\begin{itemize}
\item J = Junctional escape
\item C = sinus capture
\end{itemize}

Note: shorter RR interval (sinus capture)

Sinus rhythm with 1\textsuperscript{st} degree AV block (IVCD of RBBB)

This patient has interesting AV relationships: blocks, dissociations, and escapes

\begin{itemize}
\item Take out your calipers!
\end{itemize}
This patient has interesting AV relationships: blocks, dissociations, and escapes
• Take out your calipers!
Incomplete AV Dissociation due to 2nd degree AV block with one sinus capture

Incomplete AV Dissociation due to 2nd degree AV block (type I) with 4 sinus captures

2nd degree AV Block (type I) with 3:2 conduction ratio

Note: shorter RR interval

This patient has interesting AV relationships: blocks, dissociations, and escapes

• Take out your calipers!
Learn to use calipers

• Measure RR’s
• Look at PR’s
• Look for sinus captures
• Make correct connections
• Have fun!
Conclusions
1. Patient in sinus rhythm with periods of sinus bradycardia
2. 1\textsuperscript{st} and 2\textsuperscript{nd} degree AV block are noted on different strips
3. The 2\textsuperscript{nd} degree AV block is definitely type I (Wenckebach)
4. Junctional escape beats and intermittent junctional escape rhythms are noted
5. There is incomplete AV dissociation due to sinus slowing and 2\textsuperscript{nd} degree AV block (type I)
6. Sinus captures are recognized by the shorter RR intervals than the junctional escape RR intervals
7. Incidentally, there is also a bundle branch block
Oh no, not again!
Measurements: | Rhythm(s): | Conduction: | Waveform: | Interpretation: \\
---|---|---|---|---
A=260 V=139 | Atrial flutter with 2:1 conduction (blue arrows) | Normal IV | • Q’s in II, III, aVF (red arrows) | Abnormal ECG:  
1. Rhythm (atrial flutter) and rate  
2. Probable old inferior MI

**Measurements:**
- A = 260
- V = 139
- PR = ?
- QRS = 80
- QT = ?
- Axis = +15

**Rhythm(s):** Atrial flutter with 2:1 conduction

**Conduction:** Normal IV

**Waveform:**
- Normal IV
- Q’s in II, III, aVF (red arrows)

**Interpretation:**
- Abnormal ECG:
  1. Rhythm (atrial flutter) and rate
  2. Probable old inferior MI
Measurements:  
(hard to know sinus rate due to bigeminy)  
PR=130  
QRS=100 (sinus beats)  
QT=410  
Axis= 0

Rhythm (s):  
Sinus with PVC’s in a pattern of bigeminy

Conduction:  
• Normal SA, AV, IV  
• Retrograde VA conduction after PVC’s (arrows)

Waveform:  
Normal P, QRS, ST-T

Interpretation:  
Abnormal ECG:  
• Ventricular bigeminy (right ventricular PVCs)

Note: in V1 the PVC’s have a slightly fatter R wave than the sinus beats, and a >60 ms delay from QRS onset to S nadir (this distinguishes these from aberrantly conducted PACs)
M, Age 64
<table>
<thead>
<tr>
<th>Measurements:</th>
<th>Rhythm(s):</th>
<th>Conduction:</th>
<th>Waveform:</th>
<th>Interpretation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A=65</td>
<td>• Accelerated Junctional rhythm</td>
<td>• Normal AV</td>
<td>• Q's II, III, aVF</td>
<td>Abnormal ECG:</td>
</tr>
<tr>
<td>V=75</td>
<td>• Competing slower normal sinus rhythm</td>
<td>• Normal IV</td>
<td>• Q's V1, V2-5</td>
<td>1. Anterior and inferior MI's (age undetermined) with ST-T changes</td>
</tr>
<tr>
<td>PR=249 (only 2)</td>
<td></td>
<td></td>
<td>• T inversion I, aVL</td>
<td>2. Accelerated Junctional rhythm with 2 sinus captures (C) with slight QRS aberration</td>
</tr>
<tr>
<td>QRS≈~70</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QT≈~380</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Axis=0</td>
<td></td>
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</tbody>
</table>

**Abnormal ECG:**

1. Anterior and inferior MI's (age undetermined) with ST-T changes
2. Accelerated Junctional rhythm with 2 sinus captures (C) with slight QRS aberration

M, Age 64
76 year old man with hypertension
Measurements: Rhythm (s): Conduction: Waveform: Interpretation:

| A (s) | V = 110 | A-fibrillation with one PVC (note notch on the downstroke of PVC in lead V1; this is not an aberrantly conducted a-fib beat. | Normal AV and IV | • Coarse A-fib waves in V1  
• Poor R wave progression V1-4  
• Minor ST-T changes | Abnormal ECG  
1. Rhythm and rate  
2. One PVC (RV origin)  
3. Possible LVH (voltage) |

PR = ?  
QRS = 70  
QT = ~340  
Axis = +60
JSG: 76 year old woman with recurrent presyncope
Measurements:
- Rhythm (s): Sinus tachycardia
- Conduction: ? SA block (or sinus pause)
- Waveform: Monophasic R in I, aVL, V6
- Interpretation: Abnormal ECG
  1. Sino-atrial block (or sinus pause)
  2. LBBB (? Incomplete because only 120 ms QRS duration)

This is likely a manifestation of sick sinus syndrome.
Somebody with heart failure
Measurements:
A= 160  V= 80
PR=160
QRS=100
QT=360
Axis= +45

Rhythm (s):
Ectopic atrial tachycardia (note: in lead V1 this looks just like normal sinus rhythm @ 80 bpm)

Conduction:
2:1 AV block (note: one of the P waves is hidden in the T waves)

Waveform:
- Inverted P in I, II, III, aVF (arrows)
- LVH voltage (V1, V2)
- ST-T abnormalities

Interpretation:
Abnormal ECG:
1. Rhythm (atrial tachycardia)
2. LVH
Age, gender, and diagnosis unknown
Measurements:  

<table>
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<th>Conduction:</th>
<th>Waveform:</th>
<th>Interpretation:</th>
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</thead>
<tbody>
<tr>
<td>A= 240 V= 120</td>
<td>Atrial flutter with 2:1 AV block (see arrows; one of the flutter waves is hidden in the ST-T)</td>
<td>LVCD (RBBB)</td>
<td>Abnormal ECG:</td>
</tr>
<tr>
<td>PR= ?</td>
<td></td>
<td></td>
<td>1. Rhythm and rate</td>
</tr>
<tr>
<td>QRS=140</td>
<td></td>
<td></td>
<td>2. RBBB with ? Primary ST abnormalities</td>
</tr>
<tr>
<td>QT= ~320</td>
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<td></td>
<td>3. ? Old Anteroseptal MI (usually require Q-waves in V1 and V2)</td>
</tr>
<tr>
<td>Axis= +60</td>
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<td></td>
</tr>
</tbody>
</table>
70 year old man with dyspnea
Measurements:

| A=240 | V=129 |
| PR=7  |       |
| QRS=150 |     |
| QT=340 |      |
| Axis=+120 |    |

Rhythm (s):

- Atrial flutter with 2:1 block (see arrows on flutter waves); Note that lead V1 is the only lead that shows clear atrial flutter activity.
- The usual saw-tooth appearance in the inferior leads is not seen.

Conduction:

- IVCD (RBBB)

Waveform:

- ST-T changes – in part due to superimposed flutter waves.

Interpretation:

- Abnormal ECG
- 1. Rhythm (atrial flutter) and rate
- 2. Complete RBBB
- 3. Right axis deviation (criteria for LPFB are not met); primary right heart disease should be considered
79 year old woman; history of hypertension and atrial fibrillation

What is Bachman’s Bundle?
Measurements: | Rhythm (s): | Conduction: | Waveform: | Interpretation:
--- | --- | --- | --- | ---
A=54 V=54 | Sinus rhythm with 1 PAC | Normal SA, AV, IV conduction | 1. Prolonged P wave duration (>120 ms) + terminal negativity of P wave in leads II, III, aVF (arrows)  
2. Voltage and ST-T wave criteria for LVH with strain (see leads I, aVL)  
3. Note: leads V2 and V3 are interchanged (i.e., misplaced); follow the R wave transition in those leads. | Abnormal ECG  
1. Advanced interatrial conduction abnormality (block in Bachman’s bundle which connects RA with LA); see p61 in the PDF Outline.  
2. LVH with strain  
3. Rhythm (one PAC) |
PR=200 |  |  | |
QRS=110 |  |  | |
QT=380 |  |  | |
Axis=-10 |  |  | |
SG: 62 year old man
Measurements:  
- Rhythm (s): Sinus with 3 aberrantly conducted PAC's (cherchez le P, see arrows)
- Conduction: Normal SA, AV, IV
- Waveform: Minor T wave abnormalities (low amplitude in leads I, aVL, V1-3)
- Interpretation: Abnormal ECG:
  1. Rhythm (PAC's)
  2. Nonspecific T wave abnormalities

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<th>Waveform</th>
<th>Interpretation</th>
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<tr>
<td>A= 70</td>
<td>Sinus with 3 aberrantly conducted PAC's</td>
<td>Normal SA, AV, IV</td>
<td>Minor T wave abnormalities</td>
<td>Abnormal ECG: 1. Rhythm (PAC's) 2. Nonspecific T wave abnormalities</td>
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<tr>
<td>V= 79</td>
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<tr>
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