Wide FLBs and QRS Tachycardias

Reading Assignment

(p30-41 and 42-44)
Welcome to the “5-Step Method”

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<tr>
<th>Measurements:</th>
<th>Rhythm (s):</th>
<th>Conduction:</th>
<th>Waveform:</th>
<th>Interpretation:</th>
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<tbody>
<tr>
<td>A= V=</td>
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<tr>
<td>PR=</td>
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<td>QRS=</td>
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<td>QT=</td>
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<tr>
<td>Axis=</td>
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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)
44 Year old man in the ER with palpitations and lightheadedness
Measurements: | Rhythm(s): | Conduction: | Waveform: | Interpretation: |
---|---|---|---|---|
A= V=210 | Wide QRS tachycardia | • IVCD | • rsR’ in V1 • Late S (rightward forces) in I, aVL, V6 |
Abnormal ECG: 1. High probability SVT with RBBB Clues: classic triphasic (rsR’) RBBB morphology in V1 is very unlikely to be VT. The most likely SVT mechanism in this ECG is AVNRT with RBBB.
65 Year old man in the ICU with hypotension
**Measurements:**

- **Rhythm (s):** Wide QRS tachycardia
- **Conduction:** IVCD
- **Waveform:**
  - Northwest quadrant axis (lead I and II both negative)
  - qR pattern in V1
  - rS pattern in V6
- **Interpretation:** Abnormal ECG: Left ventricular tachycardia

- **ECG Clues for VT in this case:** 1) NW quadrant axis; 2) qR in V1; rS in V6.

- **Clinical clues:** Hypotension
75 Year old man in the ICU with recent acute coronary syndrome
75 Year old man in the ICU with recent acute coronary syndrome

**Measurements:**

<table>
<thead>
<tr>
<th>A</th>
<th>V = 135</th>
</tr>
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<tbody>
<tr>
<td>PR</td>
<td></td>
</tr>
<tr>
<td>QRS</td>
<td>160</td>
</tr>
<tr>
<td>QT</td>
<td>360</td>
</tr>
<tr>
<td>Axis</td>
<td>+30</td>
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</tbody>
</table>

**Rhythm:** Wide QRS tachycardia

**Conduction:** IVCD

**Waveform:**
- Fat R in V1 (red arrows)
- Notch on downstroke of S in V1 (blue arrows)
- >60 ms delay from QRS onset to S wave nadir in V1

**Interpretation:**

**Abnormal ECG:**
1. Right ventricular tachycardia
   - Clues: classic VT morphology in lead V1 (RV origin)
M, Age 66
M, Age 66

Measurements:

<table>
<thead>
<tr>
<th>A=100</th>
<th>V=110</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR=</td>
<td></td>
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<tr>
<td>QRS=170</td>
<td></td>
</tr>
<tr>
<td>QT=320</td>
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<tr>
<td>Axis=+90</td>
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</tbody>
</table>

Rhythm(s):

- Sinus tachycardia (red arrows)
- Wide QRS tachycardia (VT)
- One PVC (*) from LV
- One fusion beat (F)
- One sinus capture (C)

Conduction:

- AV dissociation
- IVCD due to sequential ventricular activation (VT)

Waveform:

- Notch on downstroke of S in V1 (blue arrow)
- >60 ms delay from QRS onset to S nadir in V1 (black arrows)

Interpretation:

Abnormal ECG:
1. Right ventricular tachycardia with incomplete AV dissociation from the competing sinus tachycardia

VT Clues:
- V1 QRS morphology;
- AV dissociation with fusions and captures

VT:

- Fat R
- Classic LBBB
- RV ectopy
- Notch or slur

Notch or slur

0.06 sec
M, Age 64

Measurements:
- A= V= 200
- PR=
- QRS=150
- QT=320
- Axis= +105

Rhythm(s):
- Ventricular tachycardia

Conduction:
- IVCD due to sequential ventricular activation during VT
  - Concordant QRS complexes V1-6 (all QRS's in same direction) favors VT diagnosis

Waveform:
- Abnormal ECG:
  - Ventricular tachycardia
  - Another VT clue: initial part of QRS moves more slowly than later parts suggesting origin in ventricular muscle rather than Purkinje network (see V2, for example)

Interpretation:
- Ventricular tachycardia

56 year old man with long history of intermittent palpitations
A= V= ~200
Atrial fibrillation with rapid HR
Variable IVCD (QRS's with varying duration)
• Irregular wide QRS tachycardia
• Concordant QRS V1-6
Abnormal ECG:
• Rhythm (A-fib)
• Accessory pathway (WPW)
Clue: some QRS's occur at >300 bpm (see arrows). The AV node can’t conduct that fast; i.e., use of accessory pathway.
56 year old man with long history of intermittent palpitations (after a treatment)
Marked sinus bradycardia
- short PR
- IVC

Delta waves are negative in II, III, aVF looking like pathologic Q-waves (arrows)

Abnormal ECG:
- WPW type preexcitation
- Heart rate (sinus bradycardia)

When this person goes into atrial fibrillation (see previous ECG) there is very rapid conduction with variable wide QRS morphology

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<th>Interpretation:</th>
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<tr>
<td>A=45 V=45</td>
<td>Marked sinus bradycardia</td>
<td>short PR</td>
<td>delta waves are negative in II, III, aVF looking like pathologic Q-waves (arrows)</td>
<td>Abnormal ECG: WPW type preexcitation Heart rate (sinus bradycardia)</td>
</tr>
<tr>
<td>PR=110 (short)</td>
<td></td>
<td>IVC</td>
<td></td>
<td>When this person goes into atrial fibrillation (see previous ECG) there is very rapid conduction with variable wide QRS morphology</td>
</tr>
<tr>
<td>QRS=110</td>
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<tr>
<td>QT=440</td>
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<tr>
<td>Axis= -10</td>
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</table>
47 year old woman with recent onset of palpitations
Measurements: | Rhythm(s): | Conduction: | Waveform: | Interpretation:
---|---|---|---|---
A= | V= 160 | Supraventricular tachycardia | 2:1 LBBB | Alternating notched monophasic R in I, aVL, V6 (LBBB) | Abnormal ECG:
• Rhythm/Rate: SVT (probably AVNRT)
• Conduction (2:1 LBBB)

Note: This is an unusual SVT due to the alternating 2:1 LBBB. At a slower rate all the QRS’s would likely be narrow.
Check out the V1 rhythm strip
Measurements | Rhythm(s) | Conduction | Waveform | Interpretation |
--- | --- | --- | --- | ---
A ≈ 75 V ≈ 75 | Sinus rhythm (1st 2 beats) followed by accelerated ventricular rhythm (from the LV; also called an ‘isochronic’ ventricular rhythm due to a similar HR as the sinus rate) | RBBB (1st 2 beats) | rSR' (1st 2 beats) | Abnormal ECG:  
• RBBB  
• Isochronic ventricular rhythm (note the subtle AV dissociation (shortening of PR intervals) during the ventricular rhythm) |
PR ≈ 200 (1st 2 beats) |  |  |  | |
QRS = 140 |  |  |  | |
QT = 400 |  |  |  | |
Axis = +75 |  |  |  | |
67 y.o. man with syncope; brother died suddenly 10 yrs. ago
7-9a
67 y.o. man with syncope; brother died suddenly 10 yrs. ago

Rhythm: Ventricular tachycardia (RV outflow track origin; note the inferior frontal plane axis of +100 degrees and LBBB like QRS)

Waveform: wide QRS with slurred V1 downstroke

Abnormal ECG: VT
67 y.o. man with syncope; post cardioversion
Measurements: | Rhythm(s): | Conduction: | Waveform: | Interpretation: |
---|---|---|---|---|
A= 65 V= 65 | Sinus rhythm | Normal SA, AV, IV conduction | • Very tiny Epsilon waves V1-3 (arrows) • T wave inversion V1-4 | Abnormal ECG: • Arrhythmogenic right ventricular dysplasia (ARVD) • T wave abnormalities (V1-4) associated with ARVD |
PR=200 |  |  |  | Epsilon waves are subtle indicators of altered conduction in the RV outflow track associated with high risk of RVOT tachycardias (see previous ECG 7-9a) and sudden cardiac death. |
QRS=80 |  |  |  |  |
QT=400 |  |  |  |  |
Axis= 0 |  |  |  |  |
25 year old man ‘found down’ in bathroom: rhabdomyolysis and acute renal failure; admitted to shock/trauma unit.
### ECG Interpretation

**Measurements:**

- **PR:**
- **QRS:** 80 (junctional beats)
- **QT:** 360
- **Axis:** +60

**Rhythm(s):**

- Accelerated junctional rhythm (J)
- Competing parasystolic ventricular rhythm with fusion beats (F); Note the constant RR interval between the parasystolic beats (F) as they merge with the junctional beats (J)

**Conduction:**

- Normal IV

**Waveform:**

- T inversion V1-3

**Interpretation:**

Abnormal ECG:
1. Parasytolic ventricular rhythm
2. Accelerated junctional rhythm
3. Nonspecific T abnormalities

Note: the fusion beats result from the merger of an RV ectopic focus with the accelerated junctional beats.

**Diagram Description:**

Abnormal ECG:

- Parasystolic ventricular rhythm
- Accelerated junctional rhythm
- Nonspecific T abnormalities

Note: the fusion beats result from the merger of an RV ectopic focus with the accelerated junctional beats.

**Amazing!**
25 year old man ‘found down’ in bathroom: rhabdomyolysis and acute renal failure; admitted to shock/trauma unit.
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<tbody>
<tr>
<td>A= V= ~85</td>
<td>• Accelerated junctional rhythm • PVC's (RV origin) in a pattern of bigeminy</td>
<td>Normal IV</td>
<td>• Normal QRS • Minor T inversion (V2)</td>
<td>Abnormal ECG: 1) Rhythm 2) Prolonged QT (for heart rate)</td>
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<tr>
<td>PR=</td>
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<tr>
<td>QRS=70</td>
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<td>QT= ~420</td>
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<td>Axis= +60</td>
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9-May-2014: LS: 70 y man; status post aortic valve replacement and quad CABG

A funny thing happened on the way through the left bundle!
Measurements:
- A= 65
- V= 65
- PR= 240
- QRS= 110 - 160
- QT= 440 - 560
- Axis= Normal

Rhythm(s):
- Sinus rhythm

Conduction:
- 1st degree AVB
- 2nd degree LBBB (note the 3 different LBBB morphologies: incomplete *, more incomplete **, and complete ***)

Waveform:
- ST-T changes secondary to the LBBB

Interpretation:
- Abnormal ECG:
  1. 1st degree AV block
  2. Incomplete LBBB

(If there such a thing as LBBB Wenckebach, or is it just an increasingly tired left bundle?)
83 year old woman; dyspnea and fatigue
Measurements:
A= 100  V=100 & 170
PR=160
QRS=120
QT=360
Axis= +15

Rhythm (s):
• Sinus tachycardia and
• Probable A-fibrillation beginning with arrow (note slight irregularity of RR)
• One PVC (*)

Conduction:
• Normal SA, AV
• LBBB

Waveform:
Secondary ST-T changes of LBBB

Interpretation:
Abnormal ECG:
1. Heart rate (tachycardia)
2. Rhythms (Sinus tachy, A-Fib with RVR, and a PVC)
3. Conduction (LBBB)