EKG Conference

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Southwest Cardiology, Inc.
CARDIAC CONDUCTION SYSTEM

- Sinoatrial node
- Bundle of His
- Atrioventricular node
- Right bundle branch
- Right ventricle
- Left atrium
- Left bundle branch
- Left anterior hemibundle
- Left posterior hemibundle
- Left ventricle
TABLE 9–2  Normal Values for Durations of Electrocardiographic Waves and Intervals in Adults

<table>
<thead>
<tr>
<th>Wave/Interval</th>
<th>Duration (msec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P wave duration</td>
<td>&lt;120</td>
</tr>
<tr>
<td>PR interval</td>
<td>&lt;120</td>
</tr>
<tr>
<td>QRS duration</td>
<td>&lt;110-120*</td>
</tr>
<tr>
<td>QT interval (corrected)</td>
<td>≥440-460*</td>
</tr>
</tbody>
</table>

*See text for further discussion.
Normal EKG
Heart Rate

- 1 big box = 200ms
- 1 small box = 40ms

<table>
<thead>
<tr>
<th>Big Boxes Between QRS complexes</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heart Rate</strong> (300/big boxes)</td>
<td>300</td>
<td>150</td>
<td>100</td>
<td>75</td>
<td>60</td>
<td>50</td>
<td>42</td>
</tr>
</tbody>
</table>
1st Degree AV Block

- >200 ms from onset of P wave to onset of QRS
2nd Degree AV Block
Type 1 - Wenkebach

- P-R interval prolongs until QRS is dropped
2nd Degree Heart Block
Type 2

- PR interval remains constant, QRS drops unexpectedly
3rd degree Heart Block

- P rate faster than QRS rate
- No correlation between P’s and QRS
Bundle Branch Blocks

- Right Bundle Branch Block
  - QRS duration >120ms (3 small boxes)
  - rsR’ in V1
  - ‘Rabbit Ears’
Bundle Branch Blocks

- Left Bundle Branch Block
  - QRS duration >120ms (3 small boxes)
  - R in V6
<table>
<thead>
<tr>
<th></th>
<th>$V_1$</th>
<th>$V_6$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td><img src="image" alt="Normal graph" /></td>
<td><img src="image" alt="Normal graph" /></td>
</tr>
<tr>
<td>RBBB</td>
<td><img src="image" alt="RBBB graph" /></td>
<td><img src="image" alt="RBBB graph" /></td>
</tr>
<tr>
<td>LBBB</td>
<td><img src="image" alt="LBBB graph" /></td>
<td><img src="image" alt="LBBB graph" /></td>
</tr>
</tbody>
</table>
### Bundle Branch Block Criteria

#### Complete left bundle branch block
- QRS duration ≥120 msec
- Broad, notched R waves in lateral precordial leads (V₅ and V₆) and usually leads I and aV₁
- Small or absent initial r waves in right precordial leads (V₁ and V₂) followed by deep S waves
- Absent septal q waves in left-sided leads
- Prolonged intrinsoid deflection (>60 msec) in V₅ and V₆*

#### Complete right bundle branch block
- QRS duration ≥120 msec
- Broad, notched R waves (rsr’, rsR’, or rSR’ patterns) in right precordial leads (V₁ and V₂)
- Wide and deep S waves in left precordial leads (V₅ and V₆)

*Criterion required by some authors.

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### Table 9-7: Common Diagnostic Criteria for Bundle Branch Blocks

<table>
<thead>
<tr>
<th></th>
<th>V₁</th>
<th>V₆</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal</strong></td>
<td><img src="image" alt="Normal ECG" /></td>
<td><img src="image" alt="Normal ECG" /></td>
</tr>
<tr>
<td><strong>RBBB</strong></td>
<td><img src="image" alt="RBBB ECG" /></td>
<td><img src="image" alt="RBBB ECG" /></td>
</tr>
<tr>
<td><strong>LBBB</strong></td>
<td><img src="image" alt="LBBB ECG" /></td>
<td><img src="image" alt="LBBB ECG" /></td>
</tr>
</tbody>
</table>

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Axis
Left Anterior Fascicular Block

- Frontal Axis -45 to -90 degrees
- QRS <120ms
- rS pattern in II, II, aVF (inferior leads)
LAFB + RBBB
Left Posterior Fascicular Block

- Frontal Axis +/-120 degrees (typically right axis deviation)
- QRS <120ms
- RS pattern I, qR pattern in II, II, aVF (inferior leads)
Fascicular Blocks

QRS Duration <120ms

LAHB (LAFB)

*Severe LAD without explanation*
- Deep S waves in II, III, aVF
- Frontal Axis < -45 to -60 degrees
- Positive in I, Negative in aVF
- Not explained by LBBB, LVH, inferior infarct

LPHB (LPFB)

*Opposite of LAFB, Rare*
- Usually Right Axis deviation
- Negative in I, Positive in aVF
- Positive in II, III, aVF
- Not explained by RVH, anterolateral infarct

Schedit, S. Basic Electrocardiography. CIBA-GEIGY Pharmaceuticals, USA, p 49.
## Fascicular Block Criteria

### TABLE 9–6 Common Diagnostic Criteria for Unifascicular Blocks

<table>
<thead>
<tr>
<th>Left anterior fascicular block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontal plane mean QRS axis of –45 to –90 degrees with rS patterns in leads II, III, and aV₁ and a qR pattern in lead aV₁</td>
</tr>
<tr>
<td>QRS duration less than 120 msec</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Left posterior fascicular block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontal plane mean QRS axis of ±120 degrees</td>
</tr>
<tr>
<td>RS pattern in leads I and aV₁ with qR patterns in inferior leads</td>
</tr>
<tr>
<td>QRS duration of less than 120 msec</td>
</tr>
<tr>
<td>Exclusion of other factors causing right axis deviation (e.g., right ventricular overload patterns, lateral infarction)</td>
</tr>
</tbody>
</table>

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### Common Causes of Atrioventricular and Intraventricular Conduction Disturbance

<table>
<thead>
<tr>
<th>Intrinsic causes</th>
<th>Congenital</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sclerodegenerative</td>
</tr>
<tr>
<td></td>
<td>Ischemia</td>
</tr>
<tr>
<td></td>
<td>Trauma (surgical)</td>
</tr>
<tr>
<td></td>
<td>Connective tissue disorders</td>
</tr>
<tr>
<td></td>
<td>Tumors</td>
</tr>
<tr>
<td></td>
<td>Sarcoidosis</td>
</tr>
<tr>
<td>Extrinsic causes</td>
<td>Drugs</td>
</tr>
<tr>
<td></td>
<td>Autonomic disorders</td>
</tr>
<tr>
<td></td>
<td>Hypothyroidism</td>
</tr>
</tbody>
</table>

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An interesting case

- 58 year old female admitted with syncope
- Seen 2 weeks ago at previous hospital for syncope, had negative workup
- Describes some clonic motions during syncope, having workup for seizures
Initial EKG
About 2 hours later
Overnight telemetry

Probably sinus rhythm with 2\textsuperscript{nd} degree type 2 heart block

3\textsuperscript{rd} degree heart block
Rapidly progressive heart block

- Dual chamber pacemaker implanted
- During a portion of testing of pacemaker the following day, only the atrial lead was paced
“Fun” EKGs
- Atrial Fibrillation
- LAFB
- Ashman phenomena
- Long QTc
Atrial Fibrillation
LA FB
RBBB
• Sinus rhythm
• SA exit block (Wenkebach 3:2)
Sinus Arrhythmia
WPW
Initiation of polymorphic VT
Long-short-long cycle
17 years
Male
Room:

- Vent. rate: 211 bpm
- PR interval: * ms
- QRS duration: 150 ms
- QT/QTc: 0.32–0.60 ms
- P-R-T axes: * -52 116

Technician:

Billing #: Refereed by: Unconfirmed

40 Hz 25.0 mm/s 10.0 mm/mV 2 by 5 s

MAC 6002C 12SL 1 m v250
Atrial Fibrillation with WPW