Researchers have proven that working with evil or stupid people causes heart disease.

Ha ha! I wonder if the amount of stupidiousness makes a difference.

Your witty banter stinks today.
EKG Rounds

Handouts available at http://www.drstultz.com

January 5, 2004
David Stultz, MD
Cardiology Fellow, PGY 4
Overview of Topics

• How to read an EKG
• Normal EKG
• Determination of axis
• Overview of rhythm
• Bundle branch blocks
• Fun EKGs, Board topics
How to read an EKG

• Rate
• Rhythm
• Axis
• Intervals (P-R, QRS, QT)
• Wave morphology
• Other features, integration of findings
The Normal EKG

NSR
Normal axis (about 95 degrees [-30 to +105 degrees])
Is this Normal?
Arm Leads have been reversed

I and aVL have - (Q) deflection
Also, II and III have switched
Limb Leads

http://www.oucom.ohiou.edu/CVPhysiology/A013.htm
What is the Axis?
What Else do you See?
NSR, 1st degree AVB
Left Axis Deviation (-30 to -90 degrees); + in I and – in avF
RBBB
Old Inferior MI; Q’s in II, III, avF
What is the Axis?
What Else do you See?
Sinus tachycardia
Right Axis Deviation (105 to 180 degrees); + in I and – in aVF
RVH
What is the Axis?
What Else do you See?
NSR, 1st degree AVB
Northwest Axis (-90 to –180 degrees); negative in I and avF
Anterolateral infarction pattern, old; Q’s in V2-V6
Possible old Inferior infarction; Q in II only
Normal ECG Waveform (Lead I)

Normal Values for Amplitudes and Durations of ECG Parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Amplitude</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>P wave</td>
<td>0.25 mV</td>
<td>0.12 to 0.20 sec</td>
</tr>
<tr>
<td>R wave</td>
<td>1.60 mV</td>
<td>0.35 to 0.44 sec</td>
</tr>
<tr>
<td>Q wave</td>
<td>25% of R wave</td>
<td>0.05 to 0.15 sec</td>
</tr>
<tr>
<td>T wave</td>
<td>0.1 to 0.5 mV</td>
<td>0.11 sec</td>
</tr>
<tr>
<td>P-R segment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-T segment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QRS complex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-T interval</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P-R interval</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q-T interval</td>
<td></td>
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</tbody>
</table>

Atrial Depolarization
Ventricular Repolarization
Ventricular Depolarization

http://www.temple.edu/biomed/einth.html
What is the Rhythm?
What Else do you See?
Normal Sinus Rhythm (60-100)
Insignificant inferior Q waves
What is the Rhythm?
What Else do you See?
Sinus Bradycardia (<60) with 1st degree AVB
RBBB
Old inferior infarction; Q’s in II, III, avF
What is the Rhythm?
What Else do you See?
Sinus Rhythm with 2nd degree AVB, Wenkebach

** Note the grouped beating pattern

LAD

Old Anteroseptal infarction; Q in 1, poor precordial R wave progression

Nonspecific intraventricular conduction delay
What is the Rhythm?
What Else do you See?
Complete Heart Block
Anteroseptal infarction (Q’s in V1-V3)
What is the Rhythm?
What Else do you See?
Atrial Fibrillation with rapid ventricular response (120)
LAD
RBBB
Lateral ST segment depression, nonspecific
What is the Rhythm?
What Else do you See?
Multifocal atrial tachycardia
1. 3 or more P wave morphologies in a single lead
2. Differing P-R intervals in a single lead
3. Irregular, Tachycardic rhythm
What is the Rhythm?
What Else do you See?
Atrial Flutter with variable conduction
RBBB
LAFB
Bundle Branch Blocks

QRS Duration >120ms

RBBB

*Look in V1*
- RSR’ in V1
- Broad S in I
- Secondary ST-T changes in V1-V2

LBBB

*Look in lateral leads*
- Broad QRS in lateral leads
- Usually positive deflection in lateral leads
- Secondary ST-T changes prominent in lateral leads

Schedit, S. Basic Electrocardiography. CIBA-GEIGY Pharmaceuticals, USA, p 46.
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.
What type of block (bundle/fascicle)?
What Else do you See?
What type of block (bundle/fascicle)?
What Else do you See?
Sinus tachycardia
LAFB
RBBB – Bifascicular Block
LAD
What type of block (bundle/fascicle)?
What Else do you See?
NSR, 1st degree AVB
LBBB
LAD
PAC with fusion beat
Probable old anteroseptal infarction
Probable old inferior infarction
What type of block (bundle/fascicle)?
What Else do you See?
*Hint: What is the rhythm?
Sinus tachycardia with 2:1 block
RBBB
PVC’s
What type of block (bundle/fascicle)?
What Else do you See?
NSR, 1st degree AVB
LBBB
What type of block (bundle/fascicle)?
What Else do you See?
NSR, 1° degree AVB
RBBB
LPFB – “Trifascicular block”
Old anteroseptal Infarction
“Fun” EKGS
What is your diagnosis?
Acute Anterior/Anteroseptal Infarction
ST elevations in V1-V4
“Reciprocal” St depressions in II, III, aVF
What is your diagnosis?
Hyperkalemia, $K^+ = 9.0!$

1. Peaked T waves
2. Prolonged QRS
3. Prolong PR/flattening of P
What is your diagnosis?
Board Question

This is a 30 year old healthy man without any current or prior symptoms. Do you:
1. Re-evaluate in 6 months
2. Stress test
3. EP study +/- ablation
4. Holter monitor
5. Nothing
WPW

1. Delta Wave
2. Widened QRS
3. Shortened PR interval

No treatment if asymptomatic
What is your diagnosis?
Board Question

This 65 year old male with crushing chest pain is seen in the ED. Initial Vitals are P110, BP 110/65. Initial treatment includes Oxygen, Nitro, Morphine, B-blocker. Subsequently the patient is diaphoretic and has a syncopal event. P is 80 with a BP of 65/40. There is no pulsus paradoxus, no murmur. The patient is treated appropriately and improves. What test would show the diagnosis? (ie try to read my mind)

1. Tilt table test
2. Signal averaged EKG
3. A different type of EKG
4. A Heart Calcium CT (EBCT)
5. Cardiac MRI
Inferior Infarction with RV extension
Check a Right Sided EKG for 1mm ST elevation in rV3 or rV4
Treat with IV fluids, try to avoid preload reducers (nitro)
Questions?