12 Lead ECG Interpretation

McHenry Western Lake County
EMS System
Topics

- Anatomy revisited
- The 12 Lead ECG device
- The 12 Lead ECG format
- Waveform components
- Lead views
Anatomy Revisited

- RCA (Right Coronary Artery)
  - Right ventricle
  - Inferior wall of LV
  - Posterior wall of LV (75%)
  - SA Node (60%)
  - AV Node (>80%)

- LCA (Left Coronary Artery)
  - Septal wall of LV
  - Anterior wall of LV
  - Inferior wall of LV
  - Posterior wall of LV (10%)
Anatomy Revisited

- SA node
- Intra-atrial pathways
- AV node
- Bundle of His
- Left and Right bundle branches
  - Left anterior fascicle
  - Left posterior fascicle
- Purkinje fibers
12 Lead ECG Device

- Device serves as a voltmeter
  - measures the flow of electricity
- Unipolar vs. Bipolar Leads
Bipolar Leads

- 1 positive and 1 negative electrode
  - RA always negative
  - LL always positive
- Traditional limb leads are examples of these
  - Lead I
  - Lead II
  - Lead III
- View from a vertical plane
Unipolar Leads

- 1 positive electrode & 1 negative “reference point”
  - Calculated by using summation of 2 negative leads
- Augmented limb leads
  - aVR, aFV, aVL
  - View from a vertical plane
- Precordial or chest leads
  - V1-V6
  - View from a horizontal plane
12 lead ECG Format

Leads that are produced by devices used in the Pre Hospital setting
12 Lead ECG Format

These typically are not seen Pre Hospital
12 Lead ECG Format

- Device prints out 2.5 sec of each lead.

- The device computer then analyzes all 10 sec of all 12 leads, but only prints 2.5 sec of each group.
12 Lead ECG Format

The computer diagnosis is not always accurate! Look at your ECG!
12 Lead ECG Format

The computer is very accurate at measuring intervals and durations.
Waveform Components

R Wave

- First positive deflection
- R wave includes the down stroke returning to the baseline
Waveform Components

Q Wave

- First negative deflection before the R wave
- Q wave includes the negative down stroke and return to baseline
Waveform Components

S Wave

- Negative deflection following the R wave
- S wave includes departure from and return to baseline
Waveform Components

QRS

- Q waves
  - Can occur normally in several leads
    - Normal Q waves called physiologic
  - Physiologic Q waves
    - < .04 sec (40ms)
  - Pathologic Q
    - > .04 sec (40ms)
Waveform Components
QRS

- Q wave
  - Measure width
  - Pathologic if greater than or equal to 0.04 seconds (1 small box)
Waveform Components

QS Complex

- Entire complex is negatively deflected
- No R wave is present
Waveform Components

J-Point

- Junction between the end of QRS and beginning of ST segment
- Where QRS stops and makes a sudden sharp change in direction
Waveform Components

ST Segment

- Segment between J-Point and beginning of T wave
Waveform Components
ST Segment

- Need reference point
  - Compare to TP segment
  - DO NOT use PR segment as reference!
Waveform Components
Practice

Find the J Point and ST segment
Waveform Components
Practice

J POINTS
ST SEGMENT
Waveform Components

Practice

Find the J Point and ST segment
Waveform Components

Practice

J POINTS

ST SEGMENT
Lead Views
### Lead Groups

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Limb Leads

Chest Leads
Inferior Wall MI

- II, III, aVF
  - View from Left Leg ⊕
  - inferior wall of left ventricle

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Inferior Wall MI

Posterior View
- Portion resting on diaphragm
- ST elevation….suspect inferior injury

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Lateral Wall MI

- 1 and AVL
  - View from Left Arm ⊕
  - Lateral wall of left ventricle

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Lateral Wall MI

- V5 and V6
  - Left lateral chest
  - Lateral wall of left ventricle

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Lateral Wall MI

- I, aVL, V5, V6
- ST elevation…
- suspect lateral wall injury

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Anterior Wall MI

- V3, V4
  - Lateral anterior chest
  - + electrode on anterior chest

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Anterior Wall MI

- V3, V4
  - ST segment elevation...suspect anterior wall injury

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Septal Wall MI

- V1, V2
  - Along sternal borders
  - Look through right ventricle and see septal wall

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Septal Wall MI

- V1, V2
- Septum is left ventricular tissue

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For each complex, determine whether the ST segment is elevated one millimeter or more above the TP segment
ST Segment Analysis

YES
YES
YES
NO
YES
NO
12 Lead ECG

- AMI recognition
  - Two things to know
    - What to look for
    - Where you are looking
AMI Recognition

- What to look for
  - ST segment elevation
    - One millimeter or more (one small box)
    - Present in two anatomically contiguous leads
The key to 12 lead ECG interpretation for AMI are Q wave, R wave, S wave and pathologic Q wave, the J point and ST segment.

Each lead looks at a specific portion of the heart through the + electrode.
Summary

- Specific changes must appear in two contiguous leads
- Changes seen in AMI are: tall, peaked T wave, elevated ST segment and a widened Q wave
- A normal 12 lead ECG does NOT rule out AMI
Special Thanks!

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