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



Leads that are produced by devices used in the Pre Hospital setting



- 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





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



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!





Find the J Point and ST segment

















Find the J Point and ST segment













Lead Groups

	aVR	VI	V4
П	aVL	V2	V5
Ш	aVF	V3	V6

Limb Leads

Chest Leads

Inferior Wall MI

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

I	aVR	VI	V4
П	aVL	V2	V5
Ш	aVF	V3	V6



Inferior Wall MI



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



Lateral Wall MI

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

I	aVR	VI	V4
П	aVL	V2	V5
III	aVF	V3	V6



Lateral Wall MI



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

I	aVR	VI	V4
Ш	aVL	V2	V5
Ш	aVF	V3	V6

Lateral Wall MI

 I, aVL, V5, V6
 ST elevation... suspect lateral wall injury

I	aVR	VI	V4
II	aVL	V2	V5
Ш	aVF	V3	V6



Anterior Wall MI

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

I	aVR	VI	V4
Ш	aVL	V2	V5
Ш	aVF	V3	V6



Anterior Wall MI

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

I	aVR	VI	V4
П	aVL	V2	V5
Ш	aVF	V3	V6



Septal Wall MI



V1, V2

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



Septal Wall MI

- V1, V2
 - Septum is left ventricular tissue

I	aVR	VI	V4
Ш	aVL	V2	V5
III	aVF	V3	V6



ST Segment Analysis



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

ST Segment Analysis





- 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

Summary

- 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

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