12 Lead ECGs:

Ischemia, Injury & Infarction

Part 1

McHenry Western Lake County
EMS
Ischemia, Injury & Infarction

- Definitions
- Injury/Infarct Recognition
- Localization & Evolution
- Reciprocal Changes
- The High Acuity Patient
The Three I’s

- Ischemia
  - lack of oxygenation
  - ST segment depression or T wave inversion
- Injury
  - prolonged ischemia
  - ST segment elevation
- Infarct
  - death of tissue
  - may or may not show a Q wave
Review of Waveform Components
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
    - < 0.04 sec (40ms)
  - Pathologic Q
    - > 0.04 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
Injury/Infarct Recognition

Well Perfused Myocardium

- Epicardial Coronary Artery
- Lateral Wall of LV
- Septum
- Interior Wall of LV
- Positive Electrode
Injury/Infarct Recognition

Normal ECG
Injury/Infarct Recognition

Ischemia

- Epicardial Coronary Artery
- Lateral Wall of LV
- Septum
- Left Ventricular Cavity
- Interior Wall of LV
- Positive Electrode
Injury/Infarct Recognition

- Ischemia
  - Inadequate oxygen to tissue
  - Represented by ST depression or T inversion
  - May or may not result in infarct or Q waves
Injury/Infarct Recognition

ST Segment Depression
Injury/Infarct Recognition

Thrombus

Ischemia
Injury/Infarct Recognition

- **Injury**
  - Prolonged ischemia
  - Represented by ST elevation
    - referred to as an “injury pattern”
  - Usually results in infarct
    - may or may not develop Q wave
Injury/Infarct Recognition

ST Segment Elevation
Injury/Infarct Recognition

Infarct

Infarcted Area Electrically Silent

Depolarization
Injury/Infarct Recognition

- Infarct
  - Death of tissue
  - Represented by Q wave
  - Not all infarcts develop Q waves
Injury/Infarct Recognition

Q Waves
Injury/Infarct Recognition

- Infarcted Area
- Electrically Silent
- Thrombus
- Ischemia
- Depolarization
Injury/Infarct Recognition

- What to Look for:
  - ST segment elevation
  - Present in two or more anatomically contiguous leads
Injury/Infarct Recognition: Practice

Look at J points and ST segments
Localization

Inferior: II, III, AVF
Septal: V1, V2
Anterior: V3, V4
Lateral: I, AVL, V5, V6
Localization

Which coronary arteries are most likely associated with each group of contiguous leads?

<table>
<thead>
<tr>
<th>I Lateral</th>
<th>aVR</th>
<th>V1 Septal</th>
<th>V4 Anterior</th>
</tr>
</thead>
<tbody>
<tr>
<td>II Inferior</td>
<td>aVL Lateral</td>
<td>V2 Septal</td>
<td>V5 Lateral</td>
</tr>
<tr>
<td>III Inferior</td>
<td>aVF Inferior</td>
<td>V3 Anterior</td>
<td>V6 Lateral</td>
</tr>
</tbody>
</table>
Please continue to part 2 of this presentation

Thanks!