CREIGHTON UNIVERSITY
EMS EDUCATION

ADVANCED 12 LEAD ECG CONCEPTS
2012
Enhances 12 lead ECG Detection of Myocardial Ischemia, Injury And Infarction

* Recognize Blocks in Electrical Activity
  Bundle Branch Blocks & Bi Fascicular Blocks
  Identify Precursors to Complete Heart Block

* Helps to recognize ECG Rhythms and Disturbances

ADVANCED 12 LEAD ECG
12 LEAD CONCEPTS
NORMAL 12 LEAD

2/15/2012
* Ischemia

* Injury

* Infarction

TRIAD OF INFARCTION
**STEMI CHECKLIST**

**ECG rate & rhythm**
- Identify & treat patient
- If pt. stable perform 12 Lead ECG

- Calibration mark
  - 10mm/1mv

- P wave upright in lead 1

- Evaluate QRS
  - > 3 boxes

(Inclusion Criteria)
- Patient **18 years** old or older
- Ischemic Discomfort for **30 minutes** but less then **12 hours**
- ST Elevation greater then **1mm** in 2 contiguous Limb Leads or **2mm** or greater in 2 contiguous Chest Leads
  - or
  - Presumed **New LBBB**

(Sgarbossa Criteria are Highly Specific for Acute Myocardial Infarction)
STEMI CHECKLIST

(Exclusion Criteria)

- Active Internal Bleeding  >  4 Weeks
- Stroke or TIA
- Any Surgery  >  4 Weeks
- Brain Tumors, AVM, Aneurysms
- Bleeding Disorders  >  Hemophilia
- Presenting HTN  >  180 systolic or 110 diastolic
- Use of Amphetamines or Cocaine  >  3 days
- Cardiogenic Shock  >  BP less 90 or intubated
- Recent Trauma  >  Includes CPR for 2 minutes
- Back Pain / Dissecting Aneurysm
- Pericarditis or Endocarditis
- Pregnancy
- Oral Anticoagulants  >  3 days
INFERIOR WALL INJURY - STEMI
INFERIOR WALL INFARCTION - STEMI

2/15/2012
ANTERIOR WALL INJURY - STEMI
ANTERIOR WALL INFARCTION - STEMI

2/15/2012
LATERAL WALL INJURY - STEMI
2/15/2012
THE UNUSUAL

MYOCARDIAL INFARCTIONS
50% of Inferior Wall MI’S

15 or 18 Lead ECG’S
  – use V4R Lead

Symptoms
  – Hypotension
  – Clear BBS
RIGHT VENTRICULAR WALL STEMI
Common / Inferior Wall MI

15 or 18 Lead ECG’S

Field use 12 Lead ECG
Reciprocal Changes
V1, V2 & V3 Tall R Waves
ST-T Depression

POSTERIOR WALL STEMI
POSTERIOR WALL STEMI
“Sub-Endocardial Wall MI”
“Non Q Wave MI”

ST-T Wave Depressions

Symptoms & Treatment
Acute Pericarditis

Early Repolarization

Left Ventricular Hypertrophy

Left Bundle Branch Block

Ventricular Pacemakers

Ventricular Rhythms

THE GREAT MIMICS
ACUTE PERICARDITIS
EARLY REPOLARIZATION
ELECTRICAL AXIS

THEORY OF ELECTRICITY
CAUSES OF AXIS DEVIATION

- LAD
  - Inferior Wall STEMI
  - Bi-Fascicular Block

- V-TACH
- COPD
- WPW
- BBB
- LVH
- RV PACING
- K + OD

- RAD
  - Anterior Lateral STEMI
  - Bi-Fascicular Block

- V-TACH
- COPD
- WPW
- BBB
- RVH
- P Embolus
- Dextrocardia
“DR. EINTHOVEN I PRESUME”

Photograph of a Complete Electrocardiograph, showing the manner in which the electrodes are attached to the patient. In this case, the hands and one foot being immersed in jars of salt solution.
EINTHOVEN'S TRIANGLE

1

2

3
IMPORTANT RELATIONSHIPS

Diagram showing angles and relationships.

- Points: F, R, L.
Limb Lead Axis
**QUADRANT SYSTEM**

- **EXTREME RIGHT AXIS**
- **ABNORMAL LEFT AXIS**
- **RIGHT AXIS**
- **NORMAL AXIS**

**- Leads I, AVF**

**QRS**

<table>
<thead>
<tr>
<th></th>
<th>NORMAL</th>
<th>ABN LEFT</th>
<th>RIGHT</th>
<th>ABN. RT.</th>
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<tbody>
<tr>
<td>I</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>AVF</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
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DEXTROCARDIA

*QRS*

LBBB .12 >

RBBB .11 >
CAUSES OF BBB

Ischemic Heart Disease
STEMI
HTN
Cardiomyopathy
Aortic Stenosis
Acute Heart Failure

Hyperkalemia
Tumors
Trauma
Syphilis
Acute Infections
Exotic Diseases
ABNORMALITY IN THE ANTERIOR OR POSTERIOR DIVISION OF THE LEFT BUNDLE BRANCHES

- ANTERIOR DIVISION IS LONGER, THINNER & LIES ANTERIOR (Single Blood Supply)
- POSTERIOR DIVISION IS SHOTER, THICKER & LIES POSTERIOR (Double Blood Supply)
* Right Bundle Branch Block
  W/
  LAH or LPH

* Suspect w/
  RBBB w/ LAD = Bifascicular Block Anterior
  RBBB w/ RAD = Bifascicular Block Posterior
BI-FASICULAR POSTERIOR

2/15/2012
PRECURSORS TO COMPLETE HEART BLOCK

- 1ST Degree AV Block with BBB
- All Types of Second Degree AV Block
- Bifascicular Blocks
  - Posterior

Medications to Use With Caution:
- ANTI ARYTHMICS
- ATROPINE
- MORPHINE
Pre Excitation Syndrome
Uses Accessory Pathways
SVT and Hypotension

* Short P-R Interval
* Widened QRS / *Delta Wave*
* ST-T Changes
WPW PATHWAYS
* > .14 Seconds
* V1 Clues
* Concordance in V Leads
* Extreme Right Axis
* HX of AMI
V-TACH - 2
WIDE TACH ?

2/15/2012
Ecg 1
ECG # 3

2/15/2012
ECG # 12
ECG # 29
ECG # 30
<table>
<thead>
<tr>
<th>Name:</th>
<th>12-Lead1</th>
<th>HR 39 bpm</th>
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<tr>
<td>ID:</td>
<td>21 Mar 03</td>
<td>03:32:57</td>
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<tr>
<td>Patient ID:</td>
<td>FR 0.196s</td>
<td>URS 0.882s</td>
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<tr>
<td>Incident:</td>
<td>QT/QTC</td>
<td>0.508s/0.402s</td>
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<tr>
<td>Age:</td>
<td>F-QRS-T Axes</td>
<td>47° 61° 103°</td>
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![ECG Graph](image)

**ECG # 35**

2/15/2012
ECG # 36
2/15/2012

*ECG # 37*