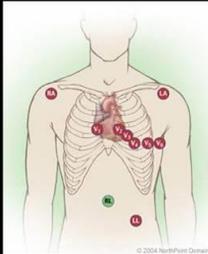


High Yield Cardiology

Bruna Varalli-Claypool, BBA, MHS
PA-C, DFAAPA
Associate Professor
University of Oklahoma
Physician Associate Program

12 lead placement



What are the standard limb leads?

- 33% 1. I, II, and III
- 33% V1, V2, V3
- 33% 3. aVR, aVL, aVF

12 leads consist of

- Standard limb leads – I, II, III
- Limb leads – aVR, aVL, aVF
 - a = augmented
 - V = voltage
 - R = right
 - L = left
 - F = foot

Precordial leads

- Also called V leads
 - V1-V6
- Information from horizontal plane
- Unipolar
 - Only a single + electrode
 - Opposing pole is the center of heart
 - As calculated by EKG machine

Electricity flows towards which electrode?

- 33% 1. Positive
- 33% Negative
- 33% 3. Ground

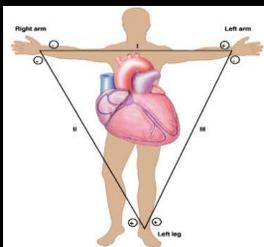
12 leads continued

- Only 10 actual locations on the chest
- Electricity flows towards positive electrode
 - Towards = positive deflection
 - Away from = negative deflection
- Continuous monitor
 - One lead – usually lead II
 - We like everything upright

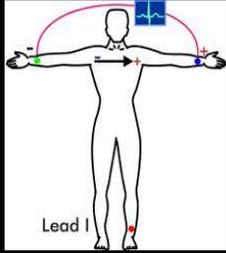
Bipolar leads

- Bipolar require 2 leads-continuous monitor
 - Positive & negative
 - 3rd lead is a ground
 - Helps with electrical interference
- Bipolar leads are I,II,III
- Axis of these form a triangle around heart
 - Einthoven's triangle

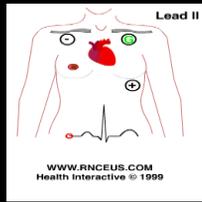
Einthoven's triangle



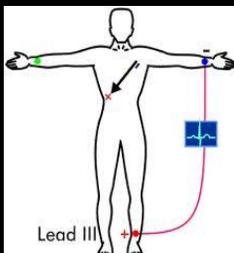
Lead I



Lead II



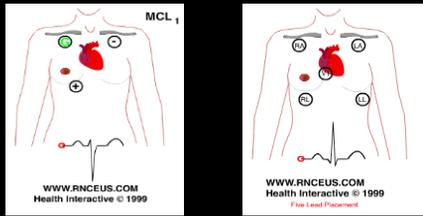
Lead III



Where is the ground lead on MCL1?

- 33% 1. LA
- 33% 2. RA
- 33% 3. RL

MCL Leads



An augmented lead

- 33% 1. Is enhanced by the ECG machine
- 33% 2. Is augmented by 50%
- 33% 3. all of the above

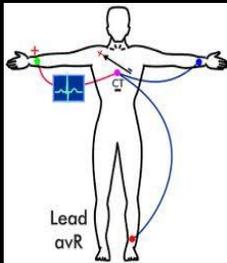
Augmented leads

- ECG machine enhances
 - Augments them by 50%
 - because amplitude is so small their amplitude is comparable to other leads
- These leads are unipolar
 - Positive electrode on body surface
 - Other 2 limb leads are ground

aVR

- positive electrode on right arm
- Waveforms negative deflection
 - Heart's electrical activity away from +
 - Views the base of the heart
 - Primarily atria and great vessels
 - DOES NOT view any part of ventricles

aVR



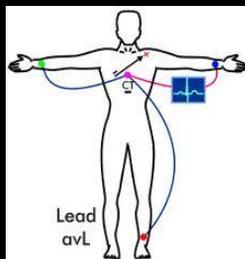
The waveform in aVL is...

- 33% 1. Upright
- 33% Negative
- 33% 3. Positive or Biphasic

aVL

- Positive electrode on left arm
- Waveforms positive or biphasic
 - Heart's electrical activity moving to + electrode
- Views lateral wall of left ventricle

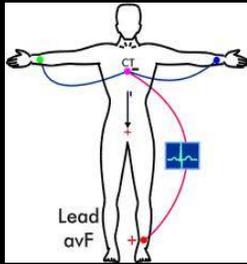
aVL



aVF

- Positive electrode on left leg
 - Some use on left lower chest
- Waveforms are +
 - Heart electrical activity toward + electrode
- Views inferior wall of left ventricle

aVF



Unipolar leads

- Only one positive electrode
- Reference point is calculated by machine
 - Zero electrical potential
- Lies in the center of heart electrical field
 - Left of interventricular septum
 - And below AV junction
- V1-V6

12 lead placement

© 2004 NorthStar Online

Lateral wall MI changes

- 33% 1. V1-V4
- 33% II, III, avF
- 33% 3. I, avL, V5 & V6

EKG Changes in MI

- Anterior wall
 - V1-V4
- Inferior wall
 - II, III, avF
- Lateral wall
 - I, avL, V5 & V6

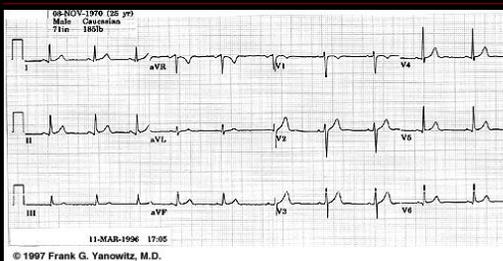
Posterior wall EKG changes in MI

- Posterior wall are reciprocal changes
 - May be ST segment depression
 - Some do a 16 lead EKG with posterior chest
 - Or take V leads off after initial 12 lead
 - repeat the V lead location on the posterior chest

Septal wall EKG changes

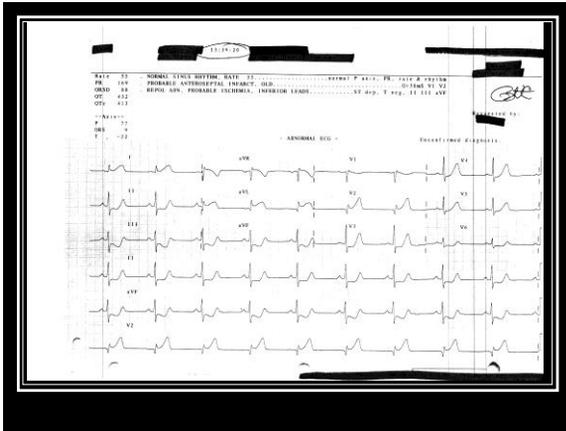
- ST-T changes
- Q waves
- Leads V1 and V2
 - Some people also include V3 in septum

12 lead sample what's wrong?



Chest pain

- 76 yr old female
- Small 2 bed ED
- Chest pain for past 2 hours
- Hx – significant for previous MI & CAD



Labs drawn & initial treatment

- CBC - CMP – CKMB - Mg
- Troponin I - PT/INR & PTT
- Why drew the above?

- Treatment
 - IV, O2, cardiac monitor, 12 lead EKG
 - ASA & pain control with nitro & morphine

Case continues

- Continues to have pain
 - Given 3 sprays of sublingual nitro
 - Currently on nitro drip & given IV morphine
- 13:39:20 EKG faxed to cardiologist in larger facility
 - Suggests serial EKG and continue current Tx
 - Prepare to administer thrombolytics

Thrombolytics vs cath lab

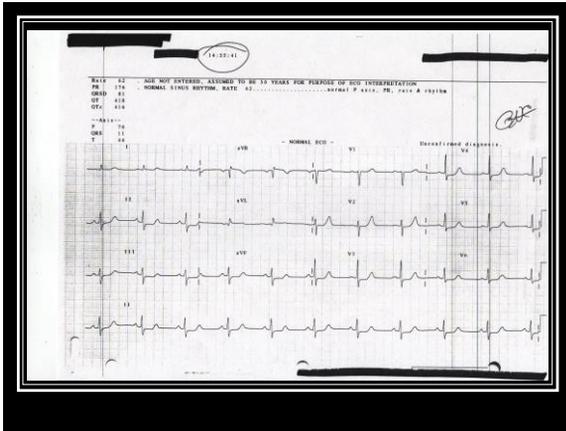
- Cath lab "gold standard"
 - Not always available where you are
- tPa current thrombolytic recommendation?
 - Contraindication check sheet
 - Know where it's kept in your ED
 - Dosing?
 - Bolus AND drip

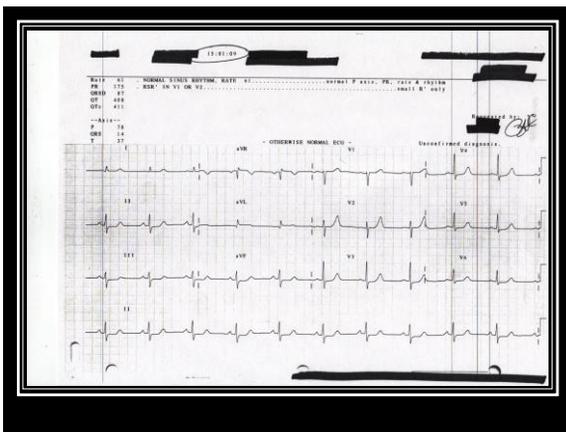
1406 labs return

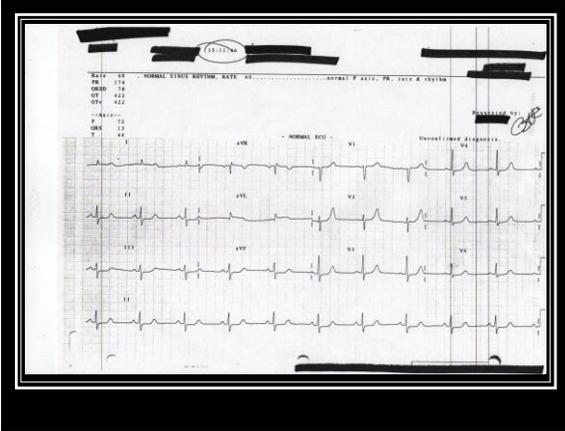
- WBC's = 12.4 (4.0-11.0)
- Na = 129 (135-145)
- BUN = 23 (8-21)
- Creatinine = 1.3 (0.7-1.2)
- Glucose = 133 (65-110)
- PT/INR = 12.2/1.0
- PTT = 23 (23.0-35.0)

Case continues

- Back on phone with cardiologist
 - Preparing to transfer to larger facility
 - Waiting on availability of ICU/CCU bed
 - Faxed copies of all EKG's
 - Pt currently pain free
 - And hemodynamically stable







Case continues

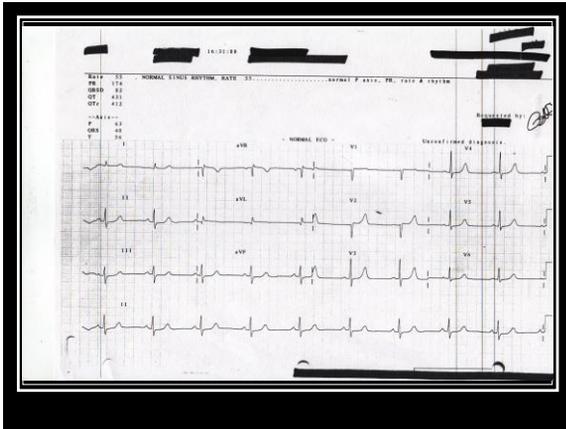
- Pt continues to be pain free
- On tPa drip after initial bolus
- Awaiting EMS transport
 - No available medics (EMT-P)
 - specialized training
 - Calling in crew
 - tPa not a routine paramedic skill at the time

1527

- Lab received
 - Total CK = 10 (20-140)
 - Sometimes total is on CMP
 - CKMB = <0.5 (0.0-3.6)
 - Troponin I = 0.14 (0.0-0.39)
 - <0.4 is negative

Case continued

- Cardiologist advised of EMS delay
- Also advised of cardiac enzymes
- He advises admit to small hospital ICU
 - Advised no staff for ICU will have to call in
 - "we" decide to keep pt in ED
 - Await EMS arrival for transfer
 - Transfer shortly after 16:31:00 EKG



2336

- Because pt is still entered in system to have serial labs the following is received at initial ED
 - CK = 373 (20-140)
 - CKMB = 65.7 (0.0-5.0)
 - Troponin I 23.51 (0.0-0.39)
- Drawn at 2200

Chest pain wrap-up

- Initial enzymes elevated?
- Initial EKG show changes?
- Where's her MI?
- What would you do?
- Do differently?
 - Beta blocker?

Questions?