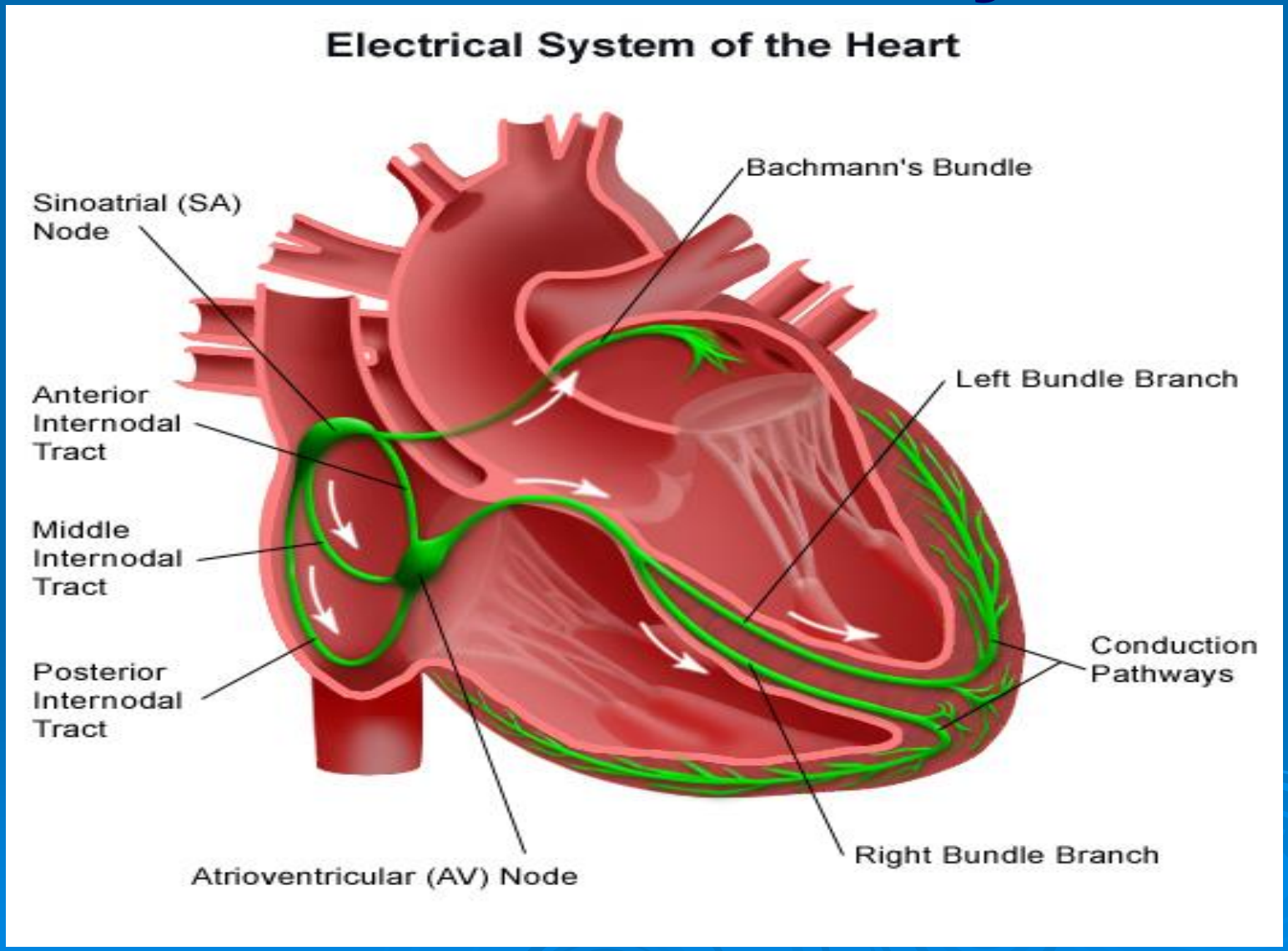
ECG Course

Presented by: Dr. Maha Subih

The Conduction System



What is a 12 lead ECG?

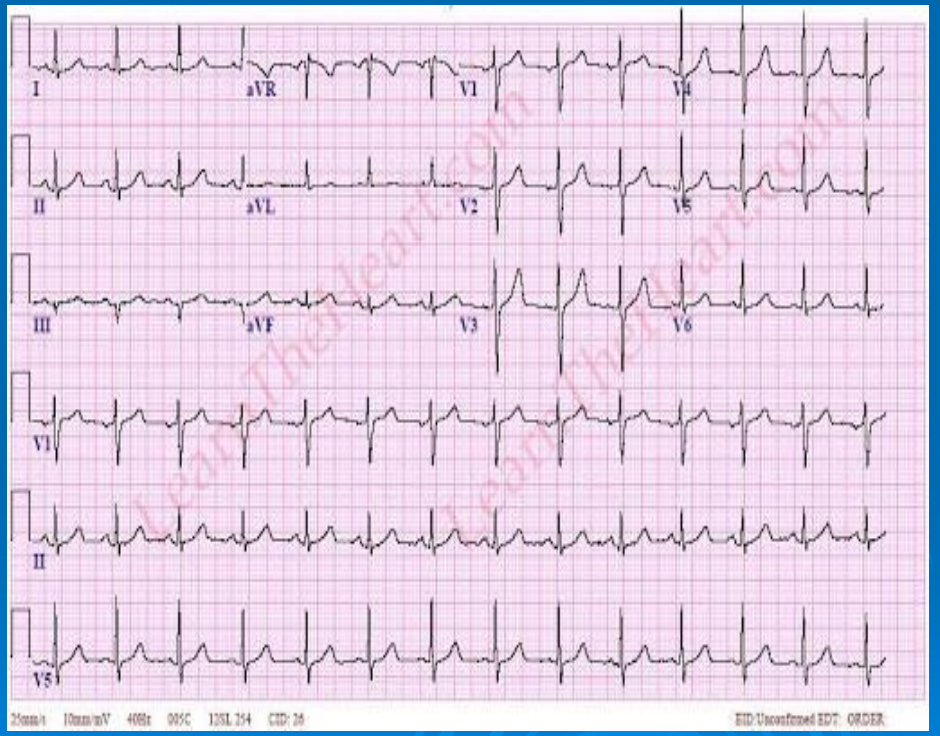
- Records the electrical activity of the heart (depolarisation and repolarisation of the myocardium)

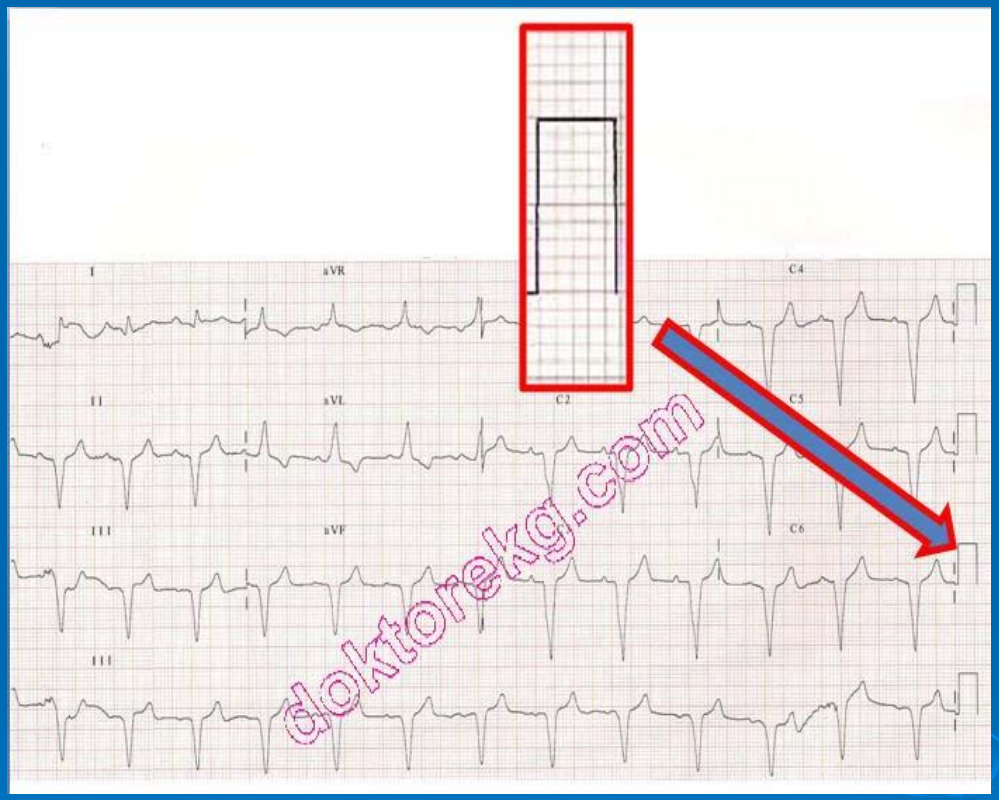
Why do a 12 lead ECG?

- Monitor patient's heart rate and rhythm
- Evaluate the effects of disease or injury on heart function
- Detect the presence of ischemia/damage
- Evaluate response to medications, e.g anti dysrhythmias
- Obtain baseline recordings before during and after surgical procedures

Procedure (cont.)

- Free from artifact
- Paper speed is 25mm/sec
- Lead placement is correct
- ECG is labelled correctly
- Calibration

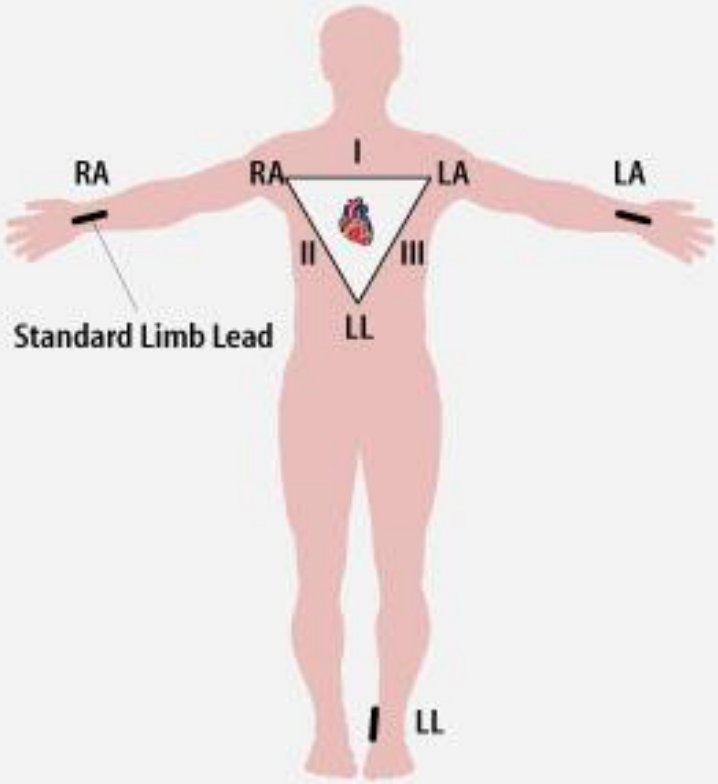


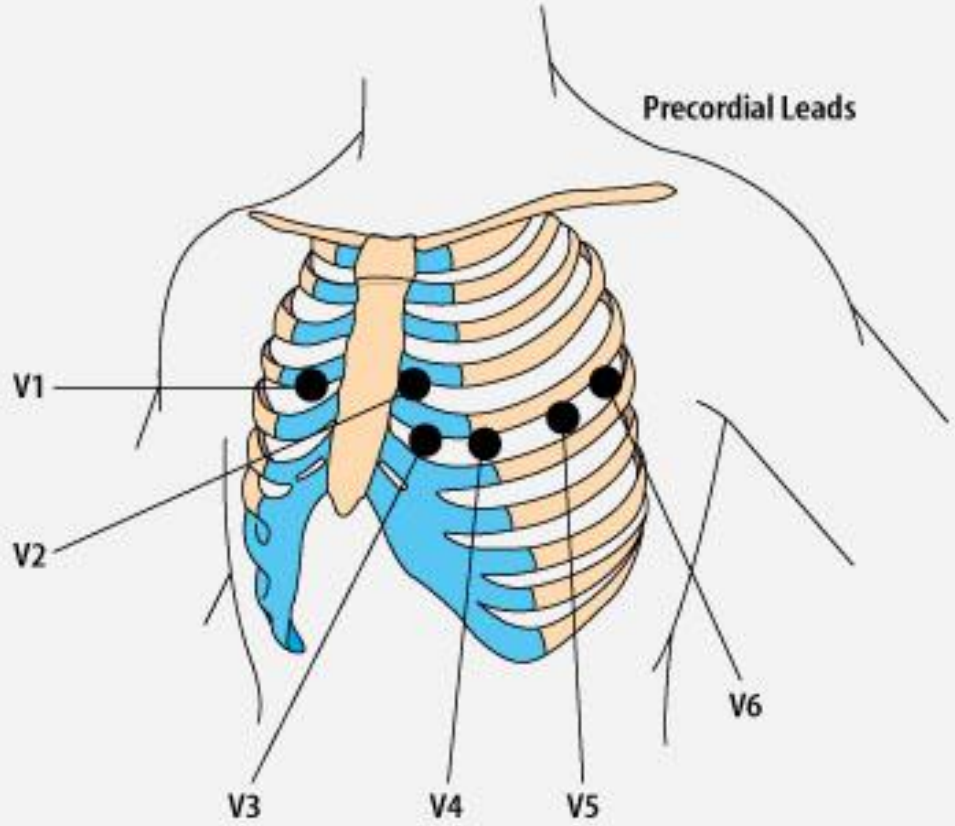


ECG artifact

Calibration

Chest Leads Limb leads

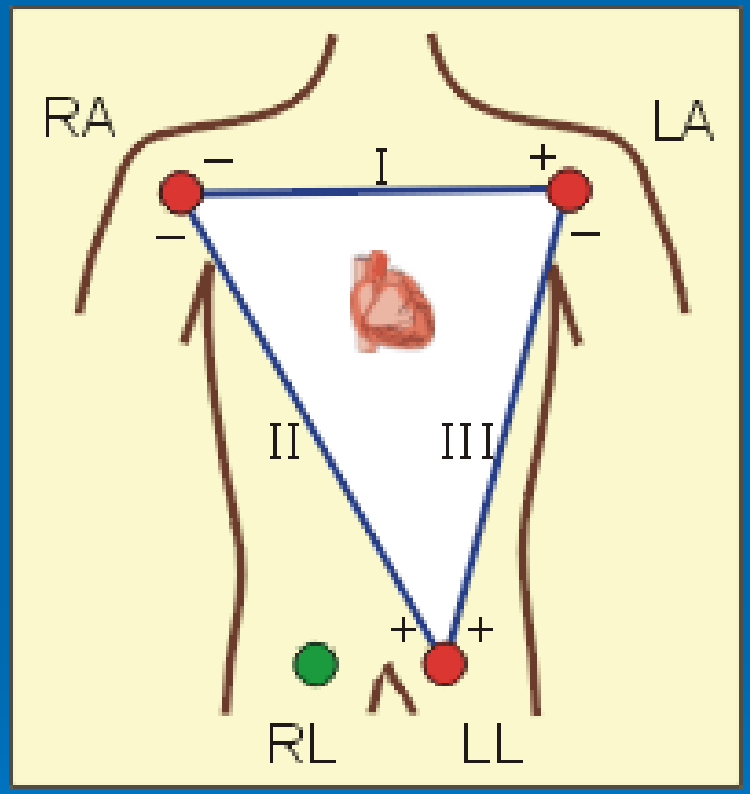




Limb Leads

3 Unipolar leads

- avR - right arm (+)
- avL - left arm (+)
- avF - left foot (+)



- note that right foot is a **ground lead**

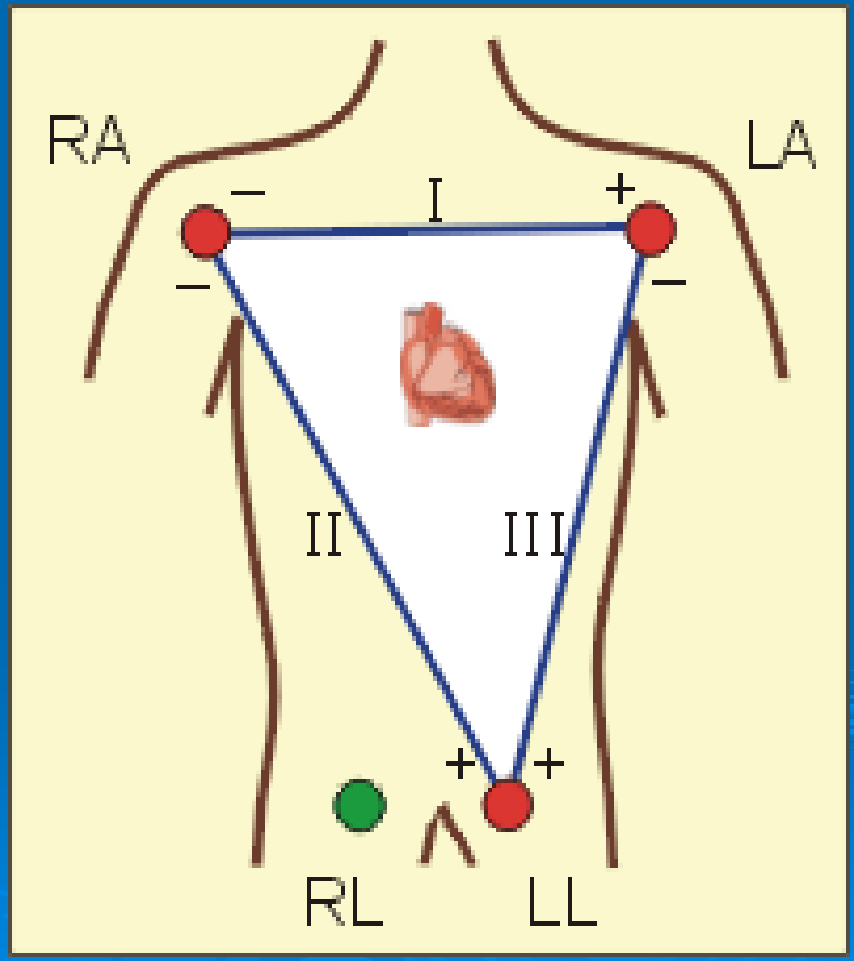
Limb Leads

3 Bipolar Leads

Lead I - measures electrical potential between right arm (-) and left arm (+)

Lead II - measures electrical potential between right arm (-) and left leg (+)

Lead III - measures electrical potential between left arm (-) and left leg (+)



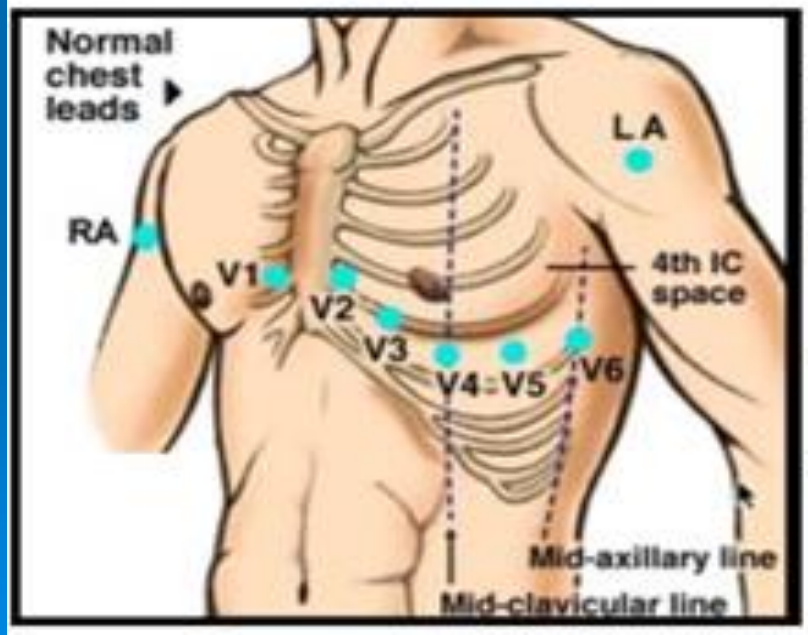
Chest Leads

6 Unipolar leads

Also known as precordial leads

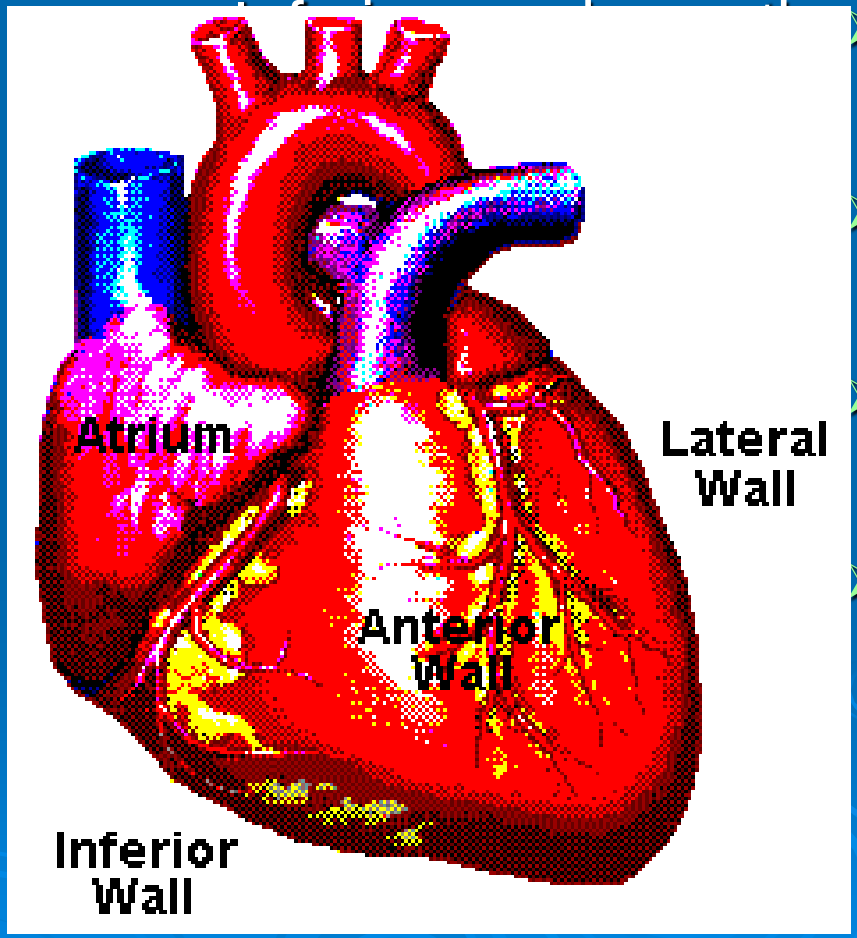
V1, V2, V3, V4, V5 and V6 - all positive

Precordial or Chest Leads



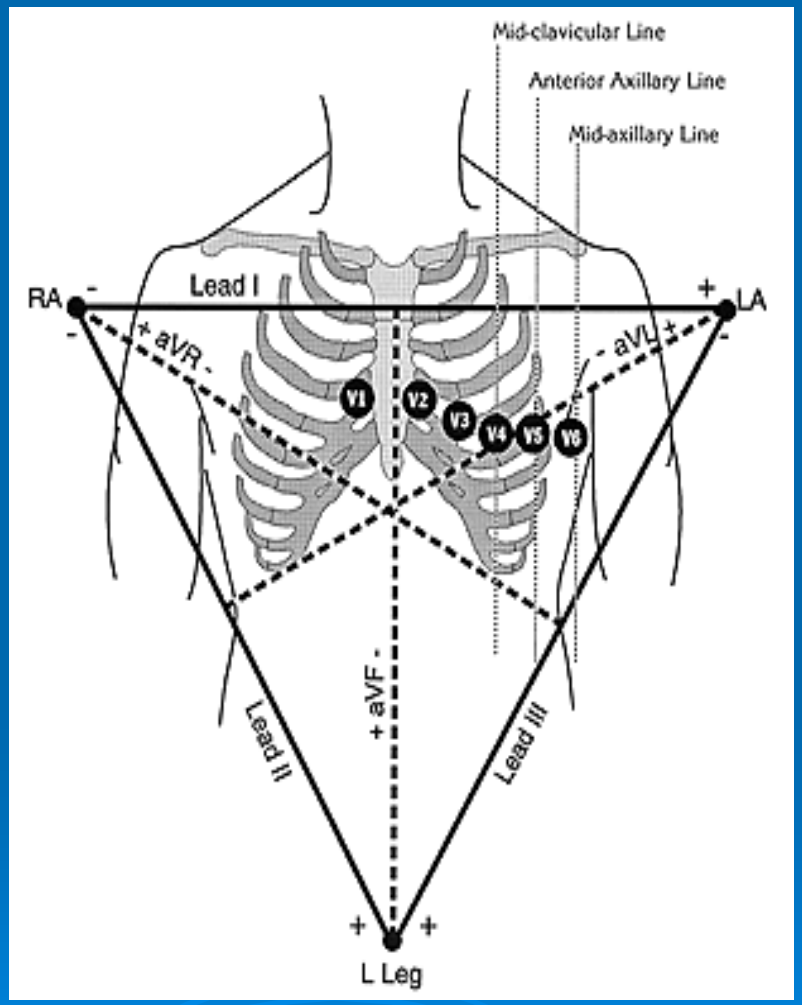
V_1	4th intercostal (right)
V_2	4th intercostal (left)
V_3	Between V_2 & V_4
V_4	Midclavicular (mid-collarbone)
V_5	5th intercostal space (anterior axillary line)
V_6	5th intercostal (midaxillary line)

Surfaces of the Left Ventricle



RIGHT

LEFT

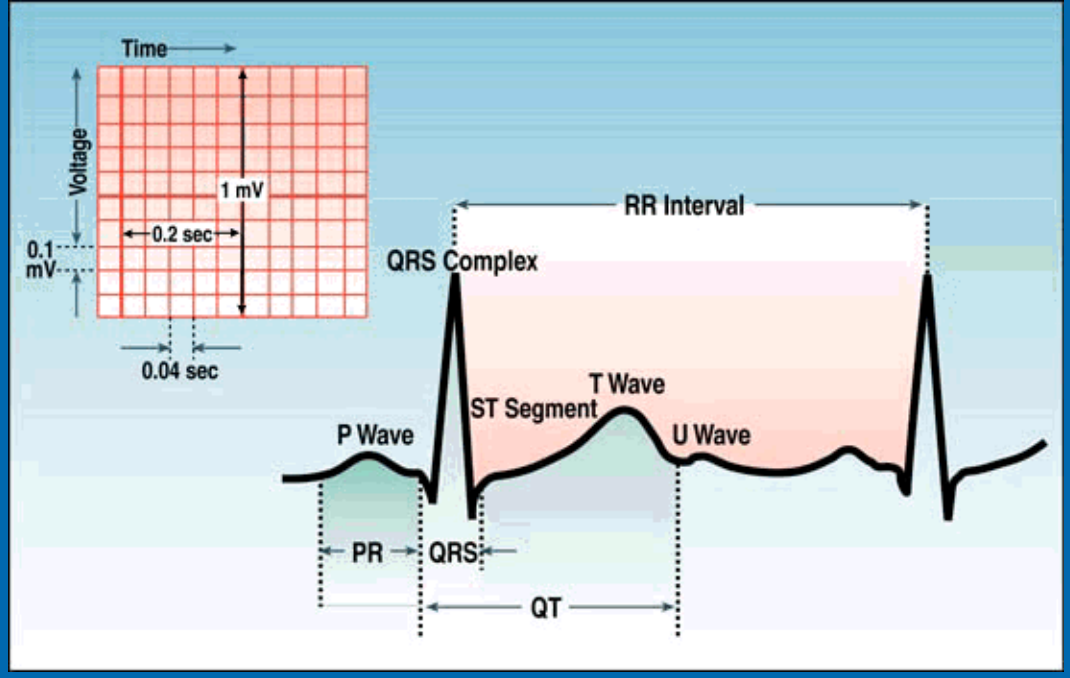


Inferior
II, III, AVF

Antero-Septal
V1,V2, V3,V4

Posterior
V1, V2, V3

Lateral
I, AVL, V5, V6



- The P wave represents atrial depolarization
- the PR interval is the time from the onset of atrial activation to the onset of ventricular activation
- The QRS complex represents ventricular depolarization
- The S-T segment should be iso-electric, representing the ventricles before repolarization
- The T-wave represents ventricular repolarization
- The QT interval is the duration of ventricular activation and recovery.

Steps in Rhythm Interpretation

Regularity

- Regular
- Irregular

Rate

P Waves

- Presence
- Relationship to QRS

PR Interval

- Normal = .12 - .20 second

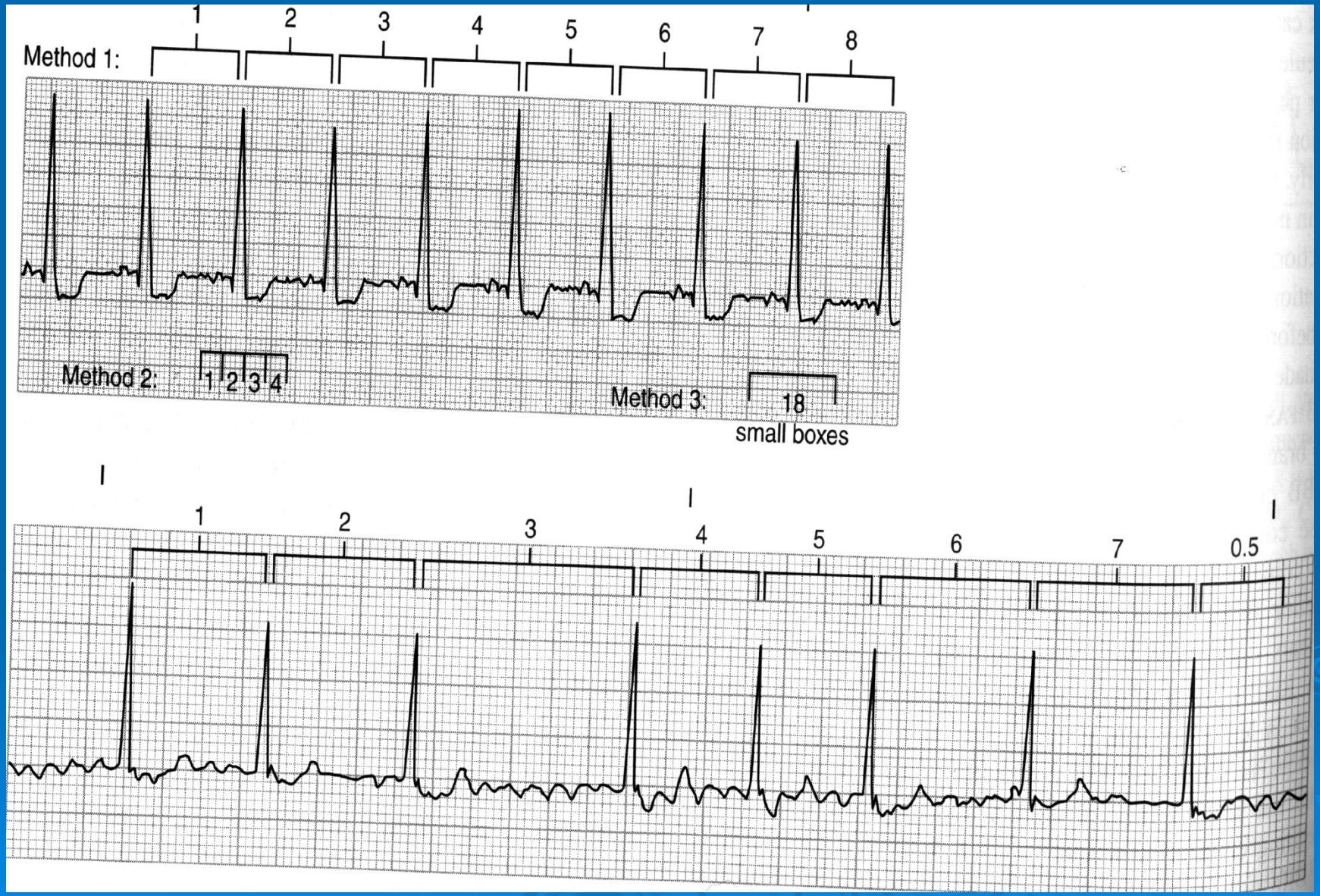
QRS Width

- Normal = .06 - .10 second

Criteria for Normal Sinus rhythm

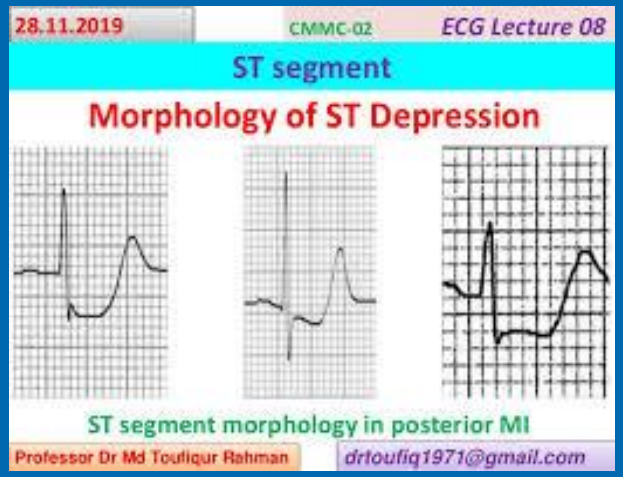
- Rhythm = Regular
- Rate = 60-100 beat / minute.
- Presence of P, QRS, T in each cycle.
- P : QRS ratio = 1 : 1.
- Normal shape, time of waves, segments and intervals

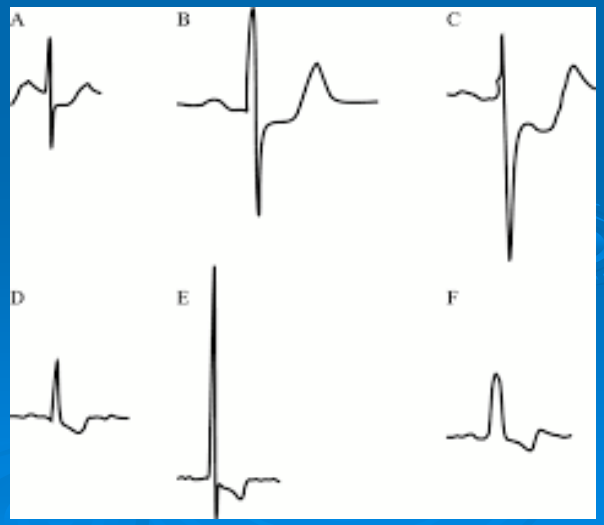
Calculation of Heart Rate



Ischemic Changes

- S-T segment elevation
- S-T segment depression
- Hyper-acute T-waves
- T-wave inversion
- Pathological Q-waves

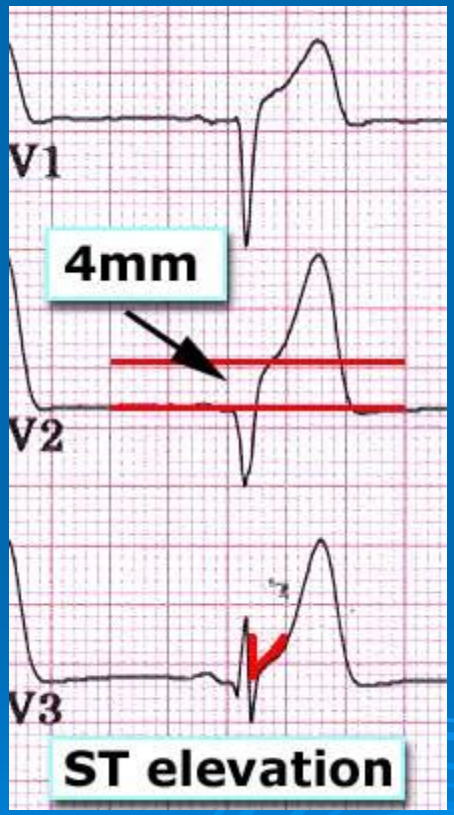




ST Segment Elevation

The ST segment lies above the isoelectric line:

- Represents myocardial injury
- It is the **hallmark** of Myocardial Infarction




I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
V1

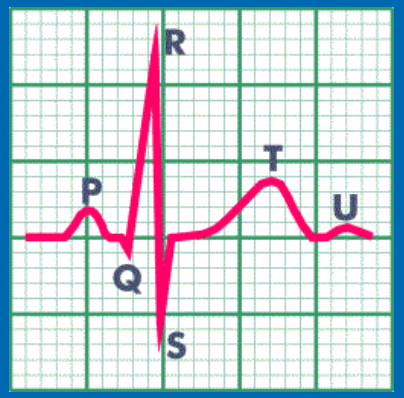
T waves

- The T wave represents ventricular repolarisation
- Should be in the same direction as and smaller than the QRS complex
- Hyperacute T waves occur with S-T segment elevation in acute MI
- T wave inversion occurs during ischemia and shortly after an MI

Q Waves

Non Pathological Q waves

Q waves of less than 2mm are normal

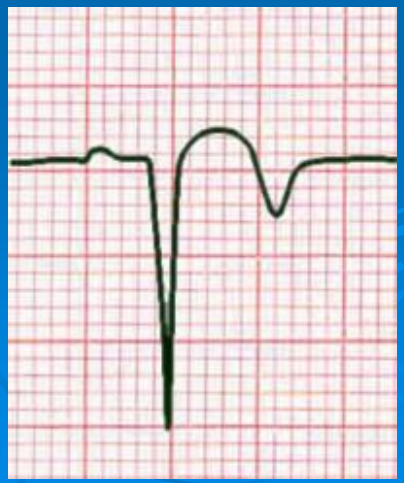


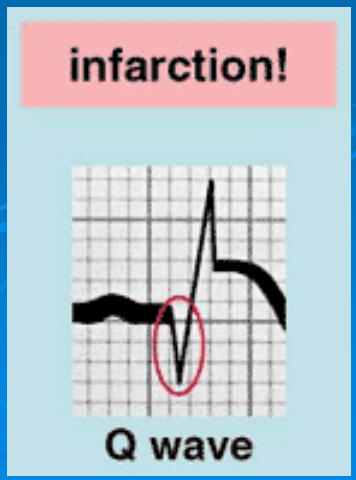
Pathological Q waves

Q waves of more than 2mm

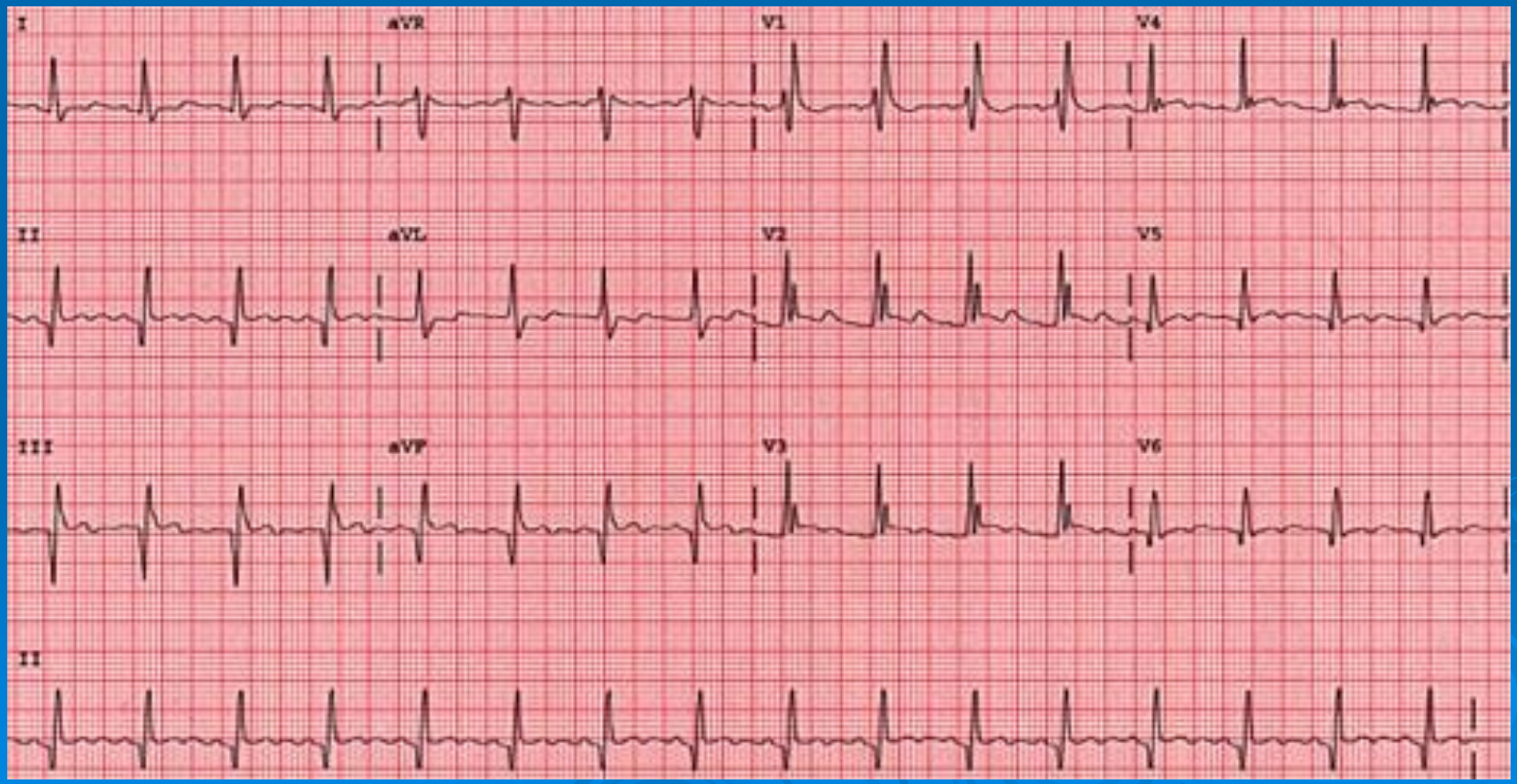
indicate full thickness myocardial damage from an infarct

Late sign of MI (evolved)





Pathological Q waves



Any Questions?