



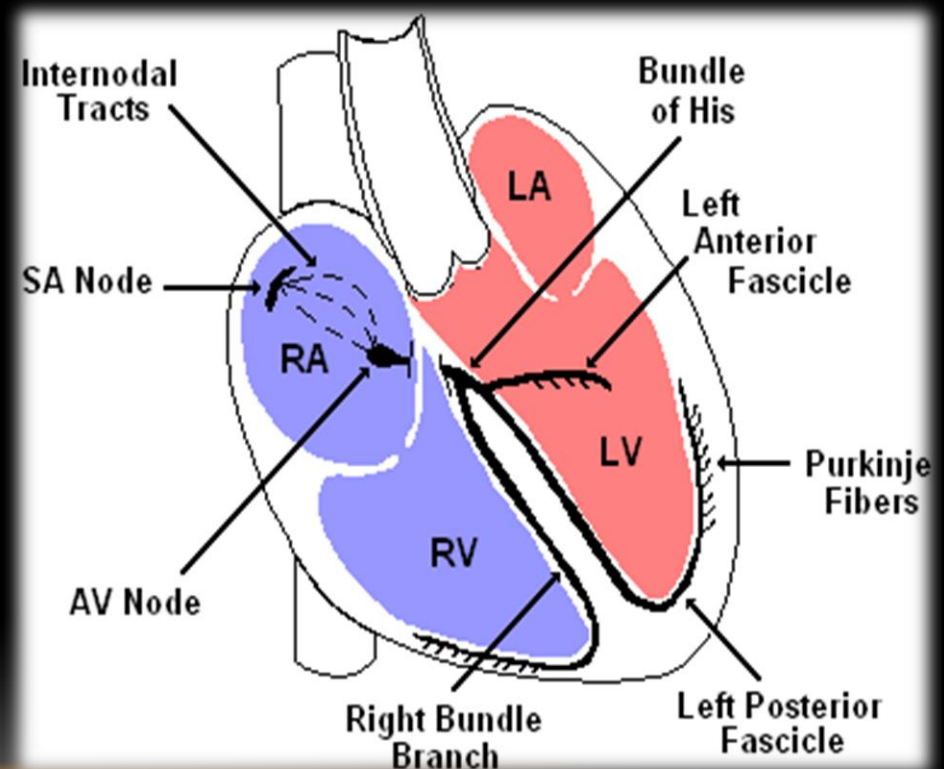
Electrocardiogram

ECG

5 November 2013

CONDUCTIVE TISSUES IN HEART

- ❑ **Sino - atrial (SA)node**
- ❑ **internodal tracts**
- ❑ **AV node**
- ❑ **Bundle of His**
- ❑ **Bundle branch**
(right & left)
- ❑ **Purkinje fibers**



Definition



Electrocardiography : is a process of recording electrical activities of heart muscle at skin surface.

Electrocardiograph : is machine amplify and record the electrical activity on a moving strip of paper.



Electrocardiogram: is the record from this procedure.

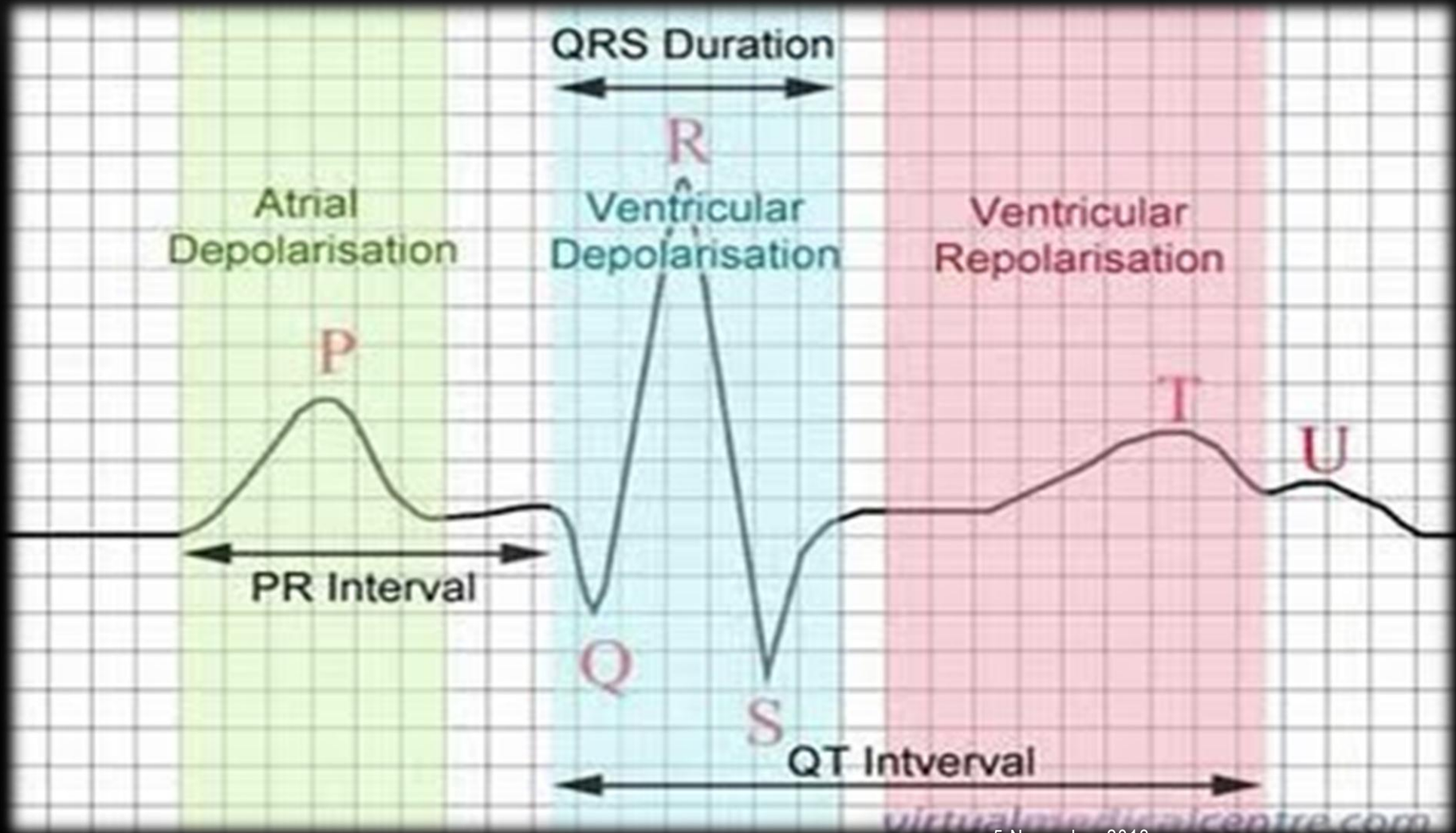


THE AIMS OF ECG MEASUREMENT

- **Heart rhythm & Rate.**
- **Heart conductive system**
- **Heart chamber size.**
- **Heart diseases.**
- **Effects of drugs & electrolytes.**

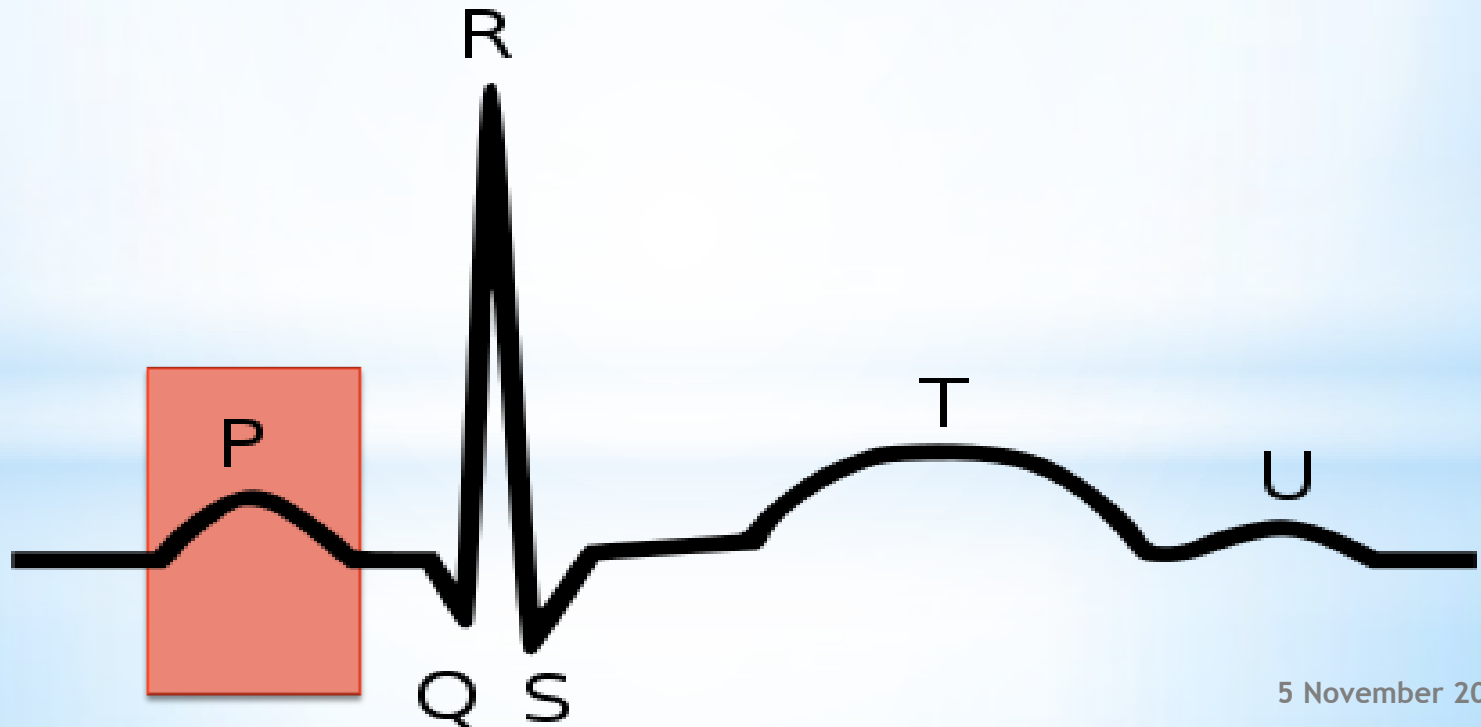


ECG WAVES



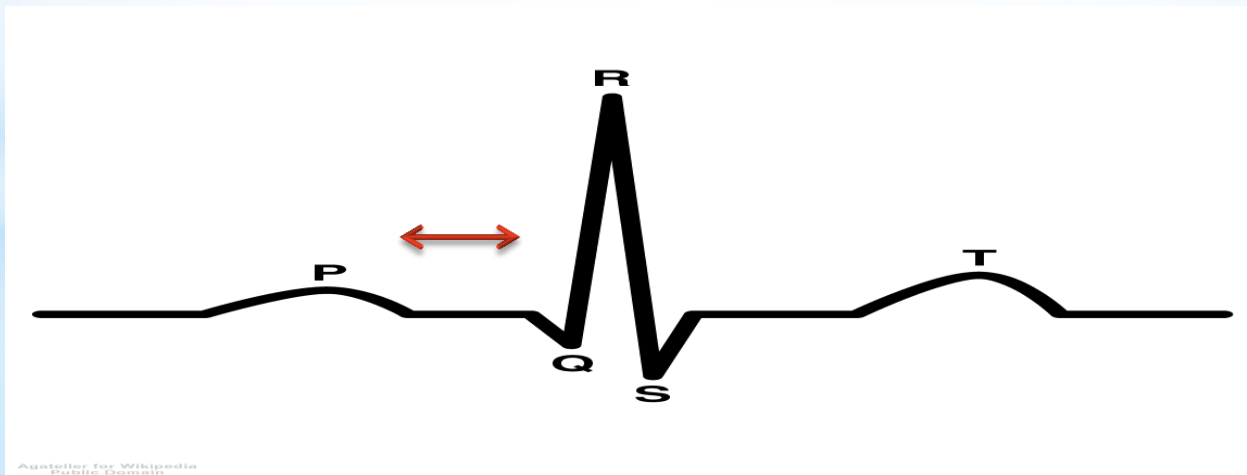
P Wave

- ❖ represents atrial depolarization
- ❖ first upward deflection
- ❖ usually 0.10 seconds or less.



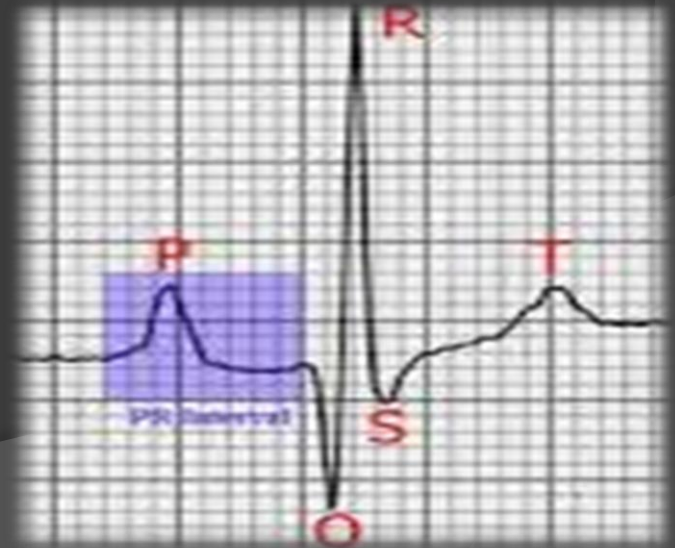
PR segment

- is isoelectrical.
- between end of P wave and beginning of QRS wave.
- It is due to delay in conduction of cardiac impulse through AV node (0.12 – 0.2 s).



PR OR PQ Interval

- ❑ **time impulse takes to move through atria and AV node**
- ❑ **between the beginning of P wave and beginning of Q or R wave because Q wave is frequently absent.**
- ❑ **normally 0.12 - 0.2 sec**



QRS Complex

- **represents ventricular depolarization**
- **usually < 0.12 sec.**

Q wave: first negative deflection after P wave.

- depolarization of septum

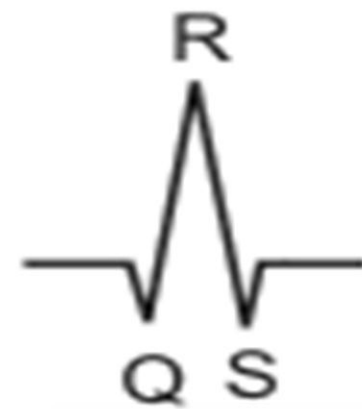
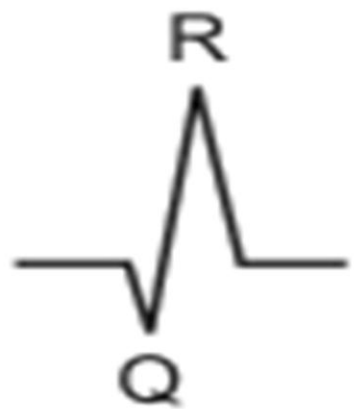
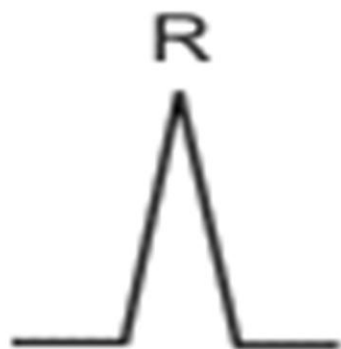
R wave: first positive deflection after P wave.

- Depolarization of LV

S wave:

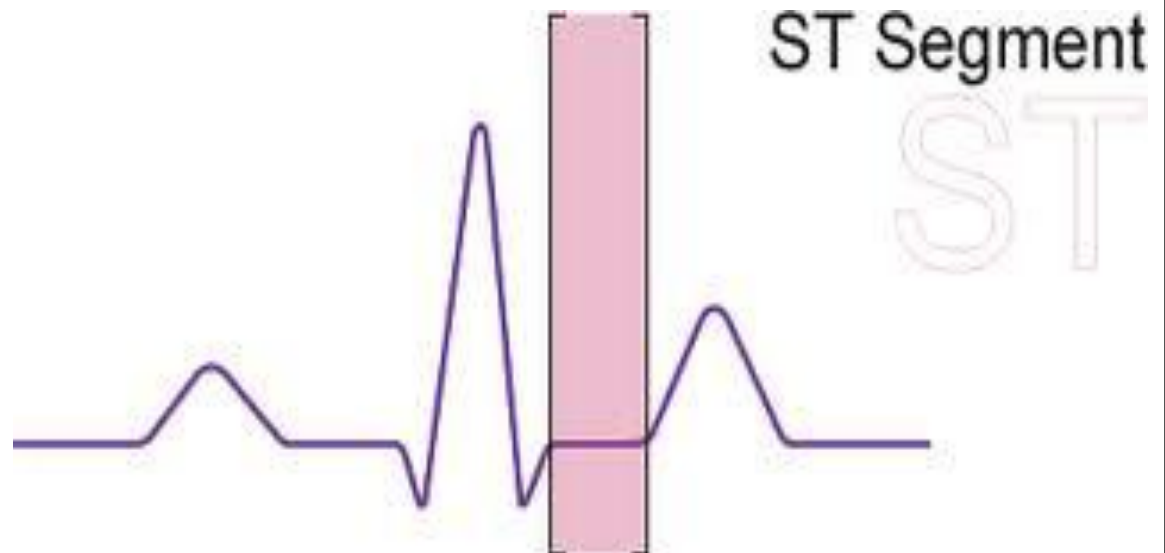
- negative deflection
- Depolarization of RV.





ST Segment

- ◉ **early repolarization of ventricles.**
- ◉ **is from end of S wave to beginning of T wave. It coincides with the plateau of ventricular action potential.**
- ◉ **elevation or depression may indicate abnormality**



PR Segment
Baseline

ST Elevation

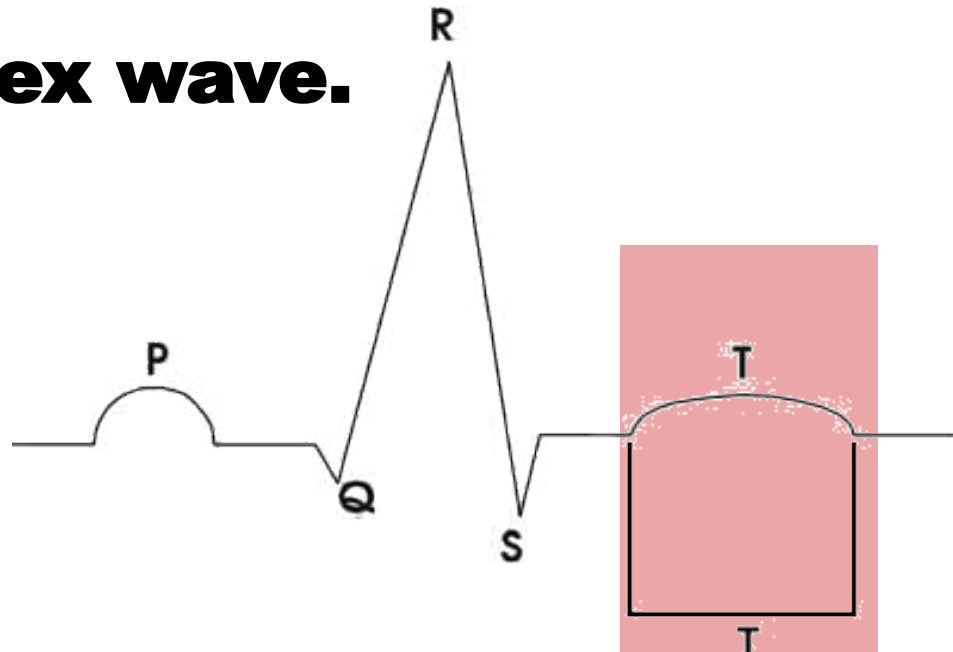
ST Depression

ST Segment



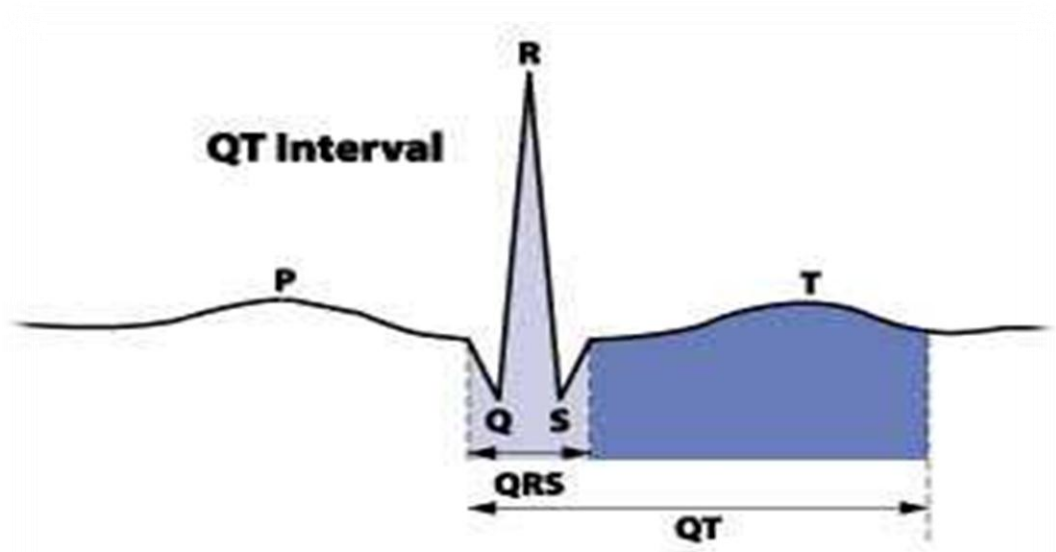
T Wave

- repolarization of ventricles.
- atrial repolarization wave is usually obscured by much larger QRS complex wave.



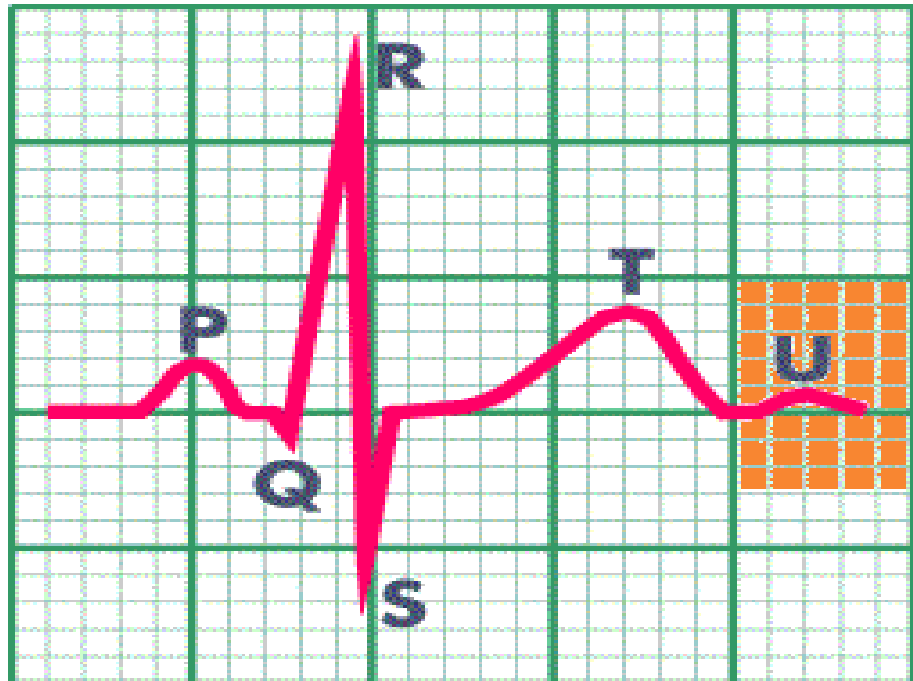
QT interval

- which is measured from the onset of QRS complex to end of the T wave (0.35-0.45s), represents the ventricular depolarization and repolarization.



U wave

- **is not constant finding, due to slow repolarization of papillary muscles.**



ECG LEADS

1- Unipolar limb leads.

They are aVR, aVL and aVF leads.

(augmented leads)



■ **2- Unipolar chest leads. They are V1 to V6.**

The location of these leads is as follows:

V₁: on the fourth intercostal space at the right sternal margin

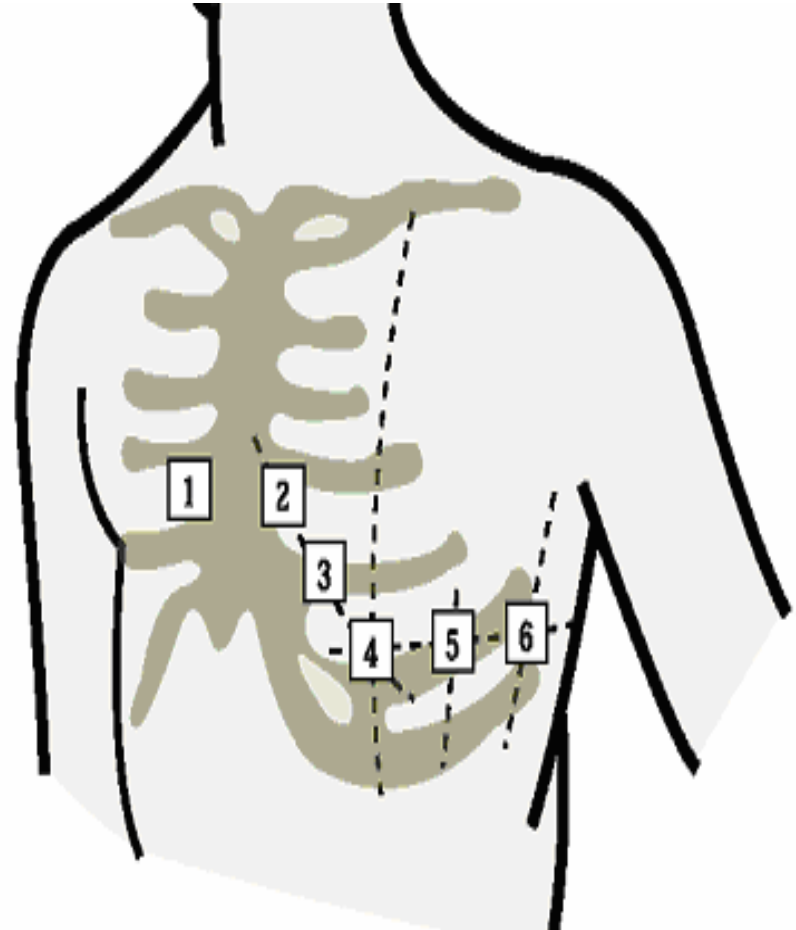
V₂: on the fourth intercostal space at the left sternal margin

V₃: midway between leads V2 and V4

V₄: on the fifth intercostal space at the midclavicular line

V₅: on the anterior axillary line at the horizontal level of lead V4

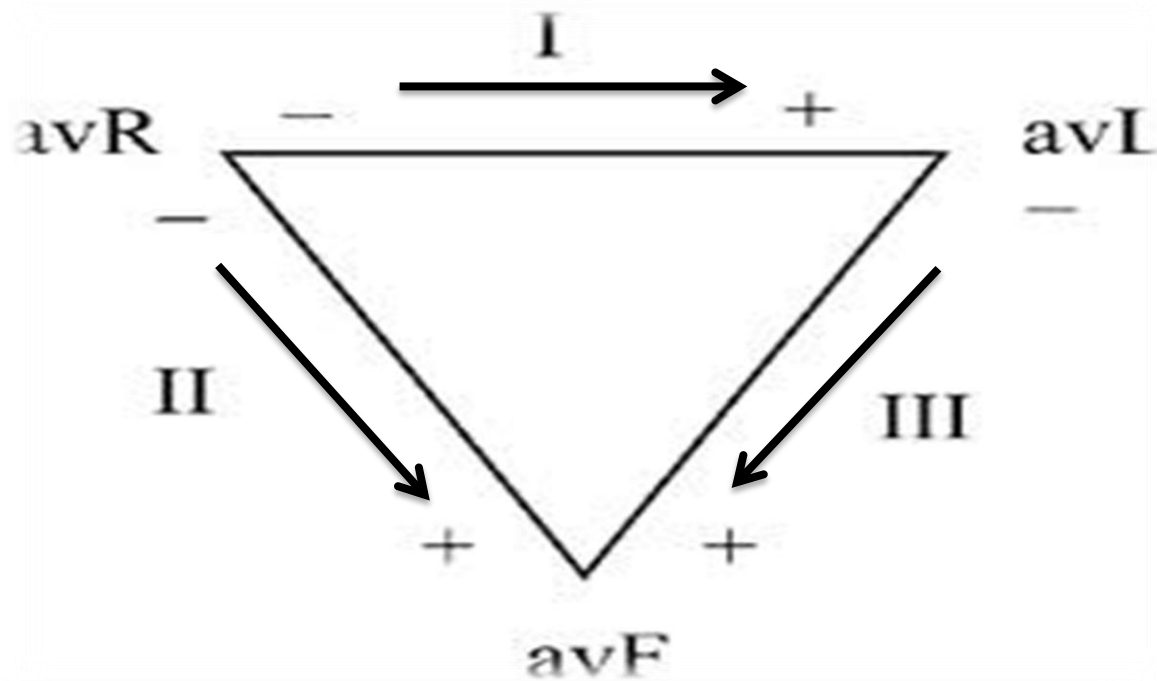
V₆: on the midaxillary line at the horizontal level of lead V4



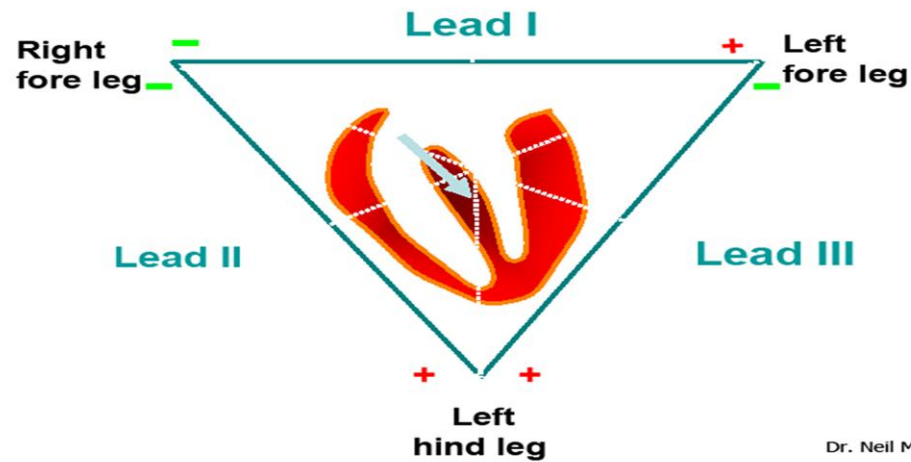
3-Bipolar limb leads:



- **LI** (between right arm and left arm).
- **LII** (between right arm and left leg) .
- **LIII** (between left arm and left leg).



EINTHOVEN'S TRIANGLE

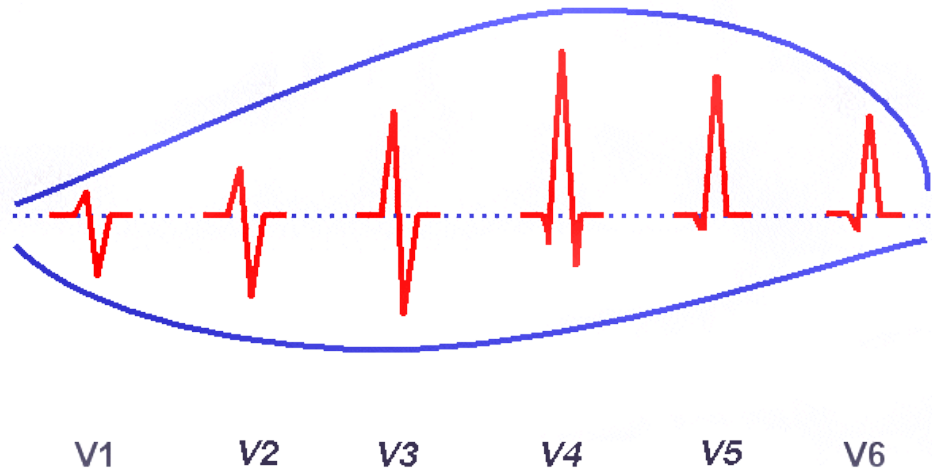


Dr. Neil Moore

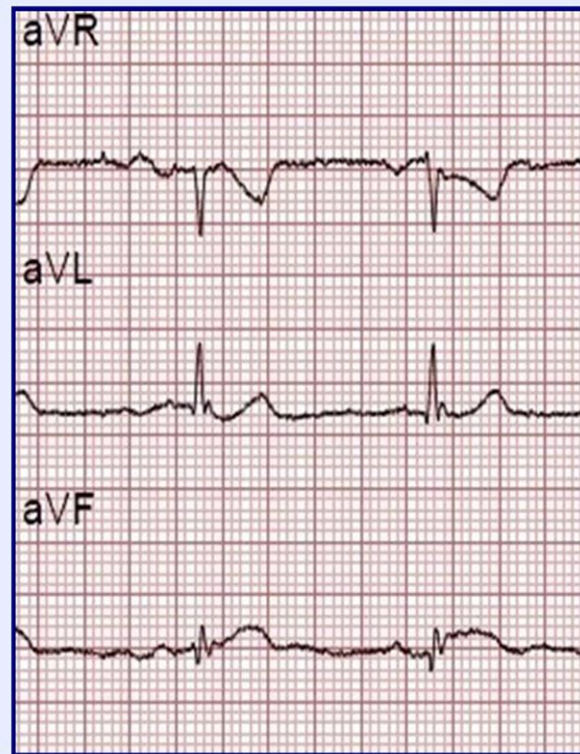
NOTES

❑ In leads V1 and V2, the QRS of the normal heart are mainly negative ,No Q wave ,small R wave and large S wave.

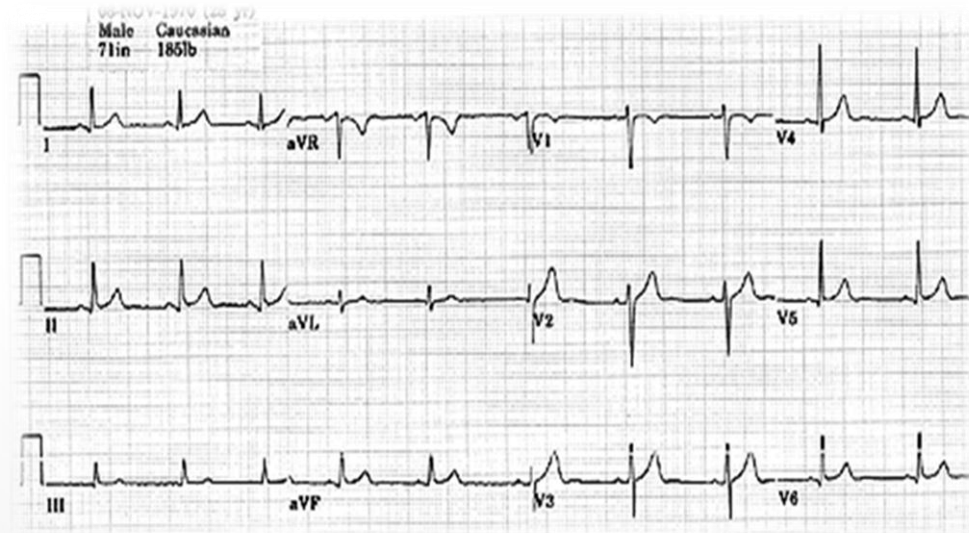
❑The QRS complexes in leads V4, V5 and V6 are mainly positive ,Small Q wave, with large R wave and moderate S wave.



- In the lead aVR, the P wave, QRS complex wave and T wave are **inverted**.



- **In normal bipolar limb leads (I, II, III) showed one similar to another because they all record positive P wave, T wave and major portion of the QRS complex(axis of the heart).**



ECG Analysis

⊕ **Rhythm(Measure R-R intervals across strip).**

⊕ **Heart rate.**

⊕ **Waves , segments & intervals.**

Note: first you should look for the aVR
(check the connection).

ECG Graph Paper



□ Each small squares of ECG paper is:

1 mm² , 0.04 s , 0.1 mV

□ Five small squares make up 1 large square
which translates into:

5 mm² , 0.2 s , 0.5 mV

ECG PAPER



Height 1 mm
or 0.1 mV



Duration

0.04 second



5 mm

0.5 mV

0.20 second

Measuring the heart rate from ECG

- ❑ The ECG paper passes 25 mm/s (25 small squares and 5 large squares) at one second.
- ❑ One minute = 60 seconds.
- ❑ The ECG paper passes:
 - **$25 \times 60 = 1500$ small squares/minute.**

OR

- **$5 \times 60 = 300$ large squares/minute.**



❑ The heart rate is a number of heart cycles per minutes, So the

❑ heart rate = 1500/ number of small squares between two R- R waves (Regular Rhythm).

OR

❑ 300 / no. of large squares between R- R waves (Regular Rhythm).



➤ When the rhythm is **irregular** as in atrial fibrillation, **The HR count during 5 seconds, as:**

No. of QRS complex in 25 large square × 12



Material and instruments

- ❑ **1- Subject.**
- ❑ **2- Electrocardiograph machine**



METHOD

- The subject must be lie down and relax (prevent muscle contraction).
- Connect up the four limb leads and six unipolar chest leads to correct sites.
- Calibrate the voltage with the 1mv.
- Record the all 12 leads.
- Record for each lead three or four complex waves .





A close-up photograph of a bouquet of roses. The bouquet is composed of many white roses and several red roses, all in various stages of bloom. The roses are set against a background of dark green, glossy leaves. The text "THANK YOU" is written in a large, bold, black, stylized font across the center of the bouquet. The letters have a slight shadow effect, making them stand out from the flowers.

THANK YOU