

Study Notes on ECG

ECG (ELECTROCARDIOGRAM)

- An ECG determines heart activity by measuring signals from electrodes Placed on the torso, arms and legs.
- The potential changes produced can be recorded by placing pair of electrodes over the myocardium itself or suitable points on body surface.
- The points that are commonly selected are right arm, the left arm and left leg. When these points are connected to each other it forms an equilateral triangle, the heart is said to lie in the center of the triangle.
- The electrical potentials generated by Heart spread towards these points by volume conduction principle (the effect of recording electrical potentials at a distance from their source generated. In other words, the recording electrodes are not in direct contact with the nerve or muscle; there is medium of some sort separating the two.
- Placing a pair of electrodes and connecting these electrodes to a galvanometer or to a cathode ray oscilloscope can record the potential changes.
- The summated potential recorded this way is known as ECG recording.
- The recordings are made on Standard, calibrated Paper.
- Along the horizontal axis is the time scale, the smallest division is equal to 0.04 seconds.
- And along the vertical scale the amplitude-voltage is recorded in millivolt(mV)—One small division is equal to 0.1 Mv.

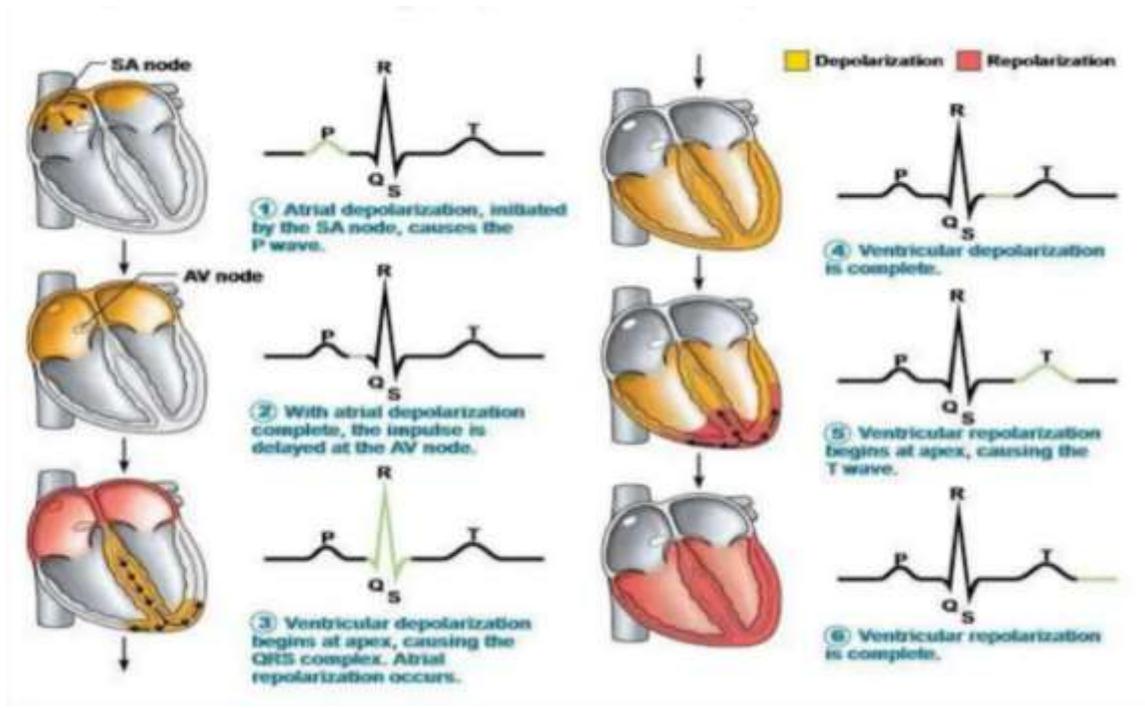
NORMAL RECORDING

- 1) The recording shows three positive deflections and two negative deflections.
- 2) P, R and T are the positive deflections and Q, and S are the negative deflections.
- 3) PR and ST are segments
- 4) Rarely following a T wave, a U wave may be seen.

CAUSES FOR VARIOUS WAVES:

Depolarization occurs in the four chambers of Heart: both atria first, and then both ventricles.

- 1) The sinoatrial (SA) node on the wall of right atrium initiates depolarization in right and left atria, causing contraction, which is symbolized by the P wave on electrocardiogram
- 2) The SA node sends the depolarization wave to the atrioventricular (AV) node which – with about a 100 ms delay to let the atria finish contracting –then causes contraction in both ventricles, seen in the QRS wave. At the same time, the atria repolarize and relax.
- 3) The ventricles are re-polarized and relaxed at T wave. This process continues regulatory, unless there is a problem in heart.



P-WAVES

- 1) P-Wave is due to atrial depolarization
- 2) The duration of Wave is 0.08 seconds
- 3) The amplitude is 0.1 to 0.3 mV.
- 4) **Clinical Importance** -Increases in amplitude is suggestive of atrial hypertrophy (increase in volume of an organ).

QRS COMPLEX

- 1) Represents the depolarization of the interventricular septum and the ventricles.
- 2) The normal duration should not exceed 0.1 second.
- 3) Normal height of R Wave is 1.2 to 1.3 mV.

T WAVE

1. It is due to ventricular repolarization.
2. The amplitude of the wave is 0.1 to 0.3mV.

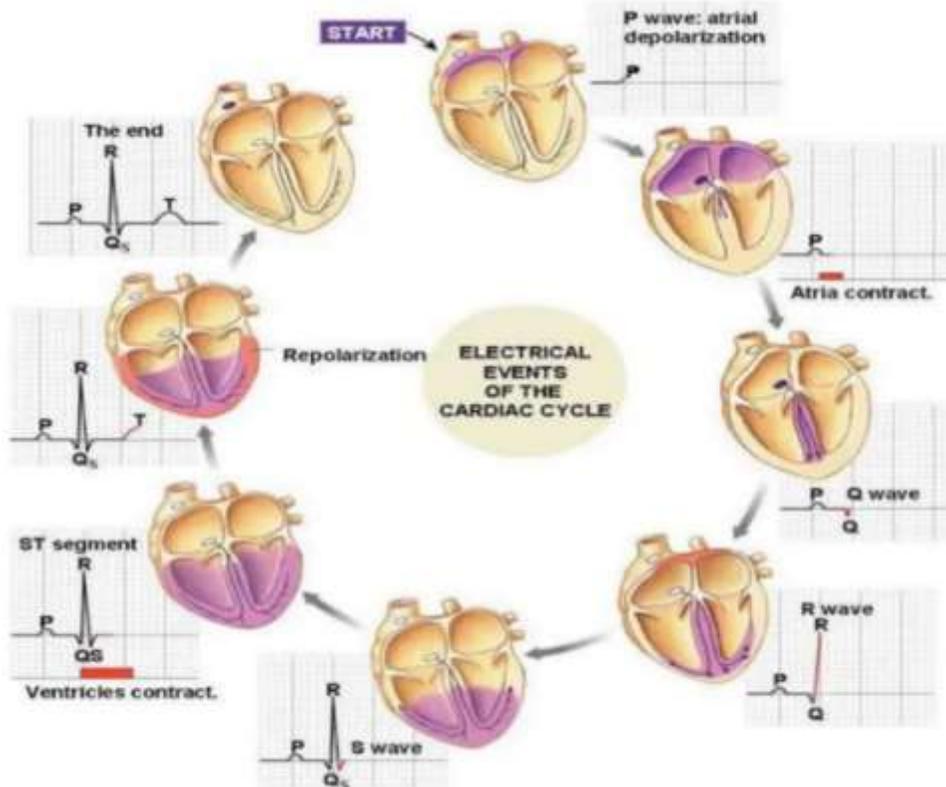
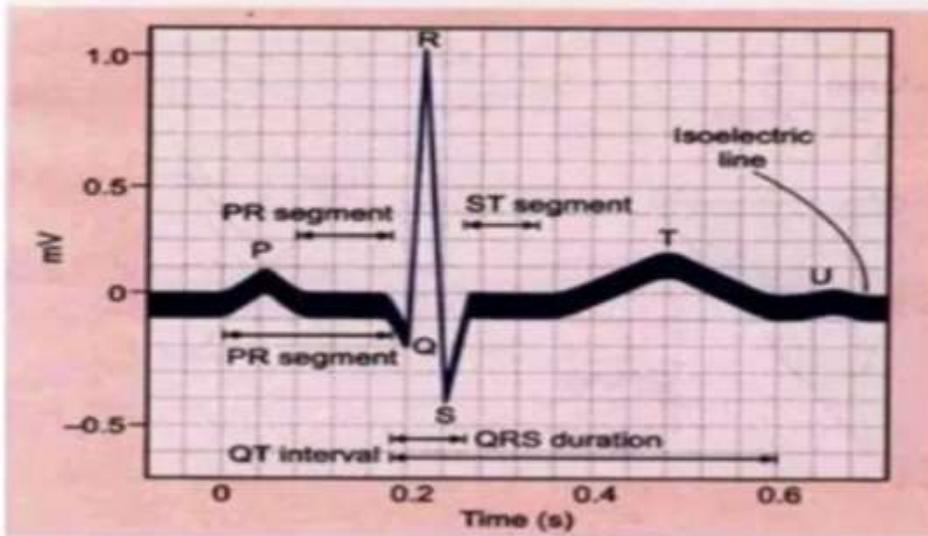
P-Q/R Interval

1. Denotes the time taken for the impulse to spread from the SA node to Purkinje fibers (are located in the inner ventricular walls of the heart, just beneath the endocardium in a space called the sub endocardium. The Purkinje fibers are specialized conducting fibers composed of electrically excitable cells that are larger than cardiomyocytes with fewer myofibrils and many mitochondria and which conduct cardiac action potentials more quickly and efficiently than any other cells in the heart. It allows the hearts conduction system to create synchronized contractions of its ventricles, and are, therefore, essential for maintaining a consistent heart rhythm).

2. Normal duration is 0.12 to 0.16
3. Measured from the beginning of Q wave to the beginning of Q/R wave.

Q-T Interval

1. It is the time interval between the beginning of Q wave and the end of the Twave
2. It Includes depolarization and Repolarization of the ventricular muscles.
3. The Normal duration is 0.37 to 0.43 seconds.



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