

Application of Cardiac Vector Hypotheses in Novel ECG Interpretation Method

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ABSTRACT

COVID-19 can cause heart and vascular damage and affect overall cardiovascular health. Coronary Heart Disease likely to remain number one killer disease of the world indefinitely due to long-term COVID-19 impact. Electrocardiogram (ECG) is one of the oldest and most important diagnostic tools for diagnosis of coronary artery disease in medicine yet its interpretation remains an arduous task. A lot of advancements had come in the ECG machine, yet the basic physics principle of ECG is not clearly understood.

The concept of Einthoven triangle and the cardiac vector describing the electrical activity of the heart was first described by Einthoven even before a century but he never published a complete detailed description of the same. After many decades, the complete Heart-Lead vector relationship and Einthoven's equilateral triangle hypotheses was published by the current author in previous research articles. Voltage recorded in a particular lead is the result of dot product between the lead vector (measured in meter) and the cardiac vector measured in volt/meter.

The heart is situated in the center of the electric field which it generates. The two upper limbs and the left lower limb are the extensions of its electrical field. Each cardiac wave (P, QRS, T) can be represented in the form of circles. All circles (see the diameter) should be formed in the left lower quadrant except QRS which can go up to -30 degree. When the angle between the 'QRS' and 'T' circles widen it usually denotes ischemia. Larger the size of a circle, higher will be the voltage. No circle should be formed during ST-segment since it is an iso-electric period. Formation of circle and its magnitude during the ST-segment indicate the amount of myocardial injury. Thus, by observing the size and location of the circles in the hex-axial reference system, interpretation can be done easily.

The present study summarizes the clinical applications of cardiac vector theory to be applied at the bed side for ECG interpretation. The combination of the 12-lead ECG with this resultant cardiac vector represented by circle provides the optimum approach to ECG interpretation. The early diagnosis can reduce the morbidity and mortality so quicker and proper interpretation of ECG report will result in saving millions of cardiac patients.

Keywords: Heart vector, Lead vector, Einthoven triangle, Novel ECG interpretation

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